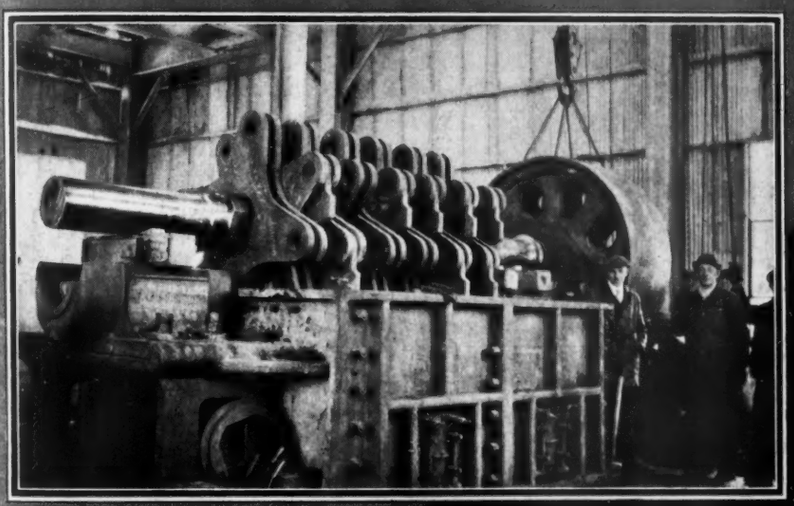
Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS** Founded 1896

Chicago, May 12, 1928 (*Issued Every Other Week*) Volume XXXI, No. 10

SOLO HAMMER CRUSHER

DURING ERECTION AT THE PLANT OF THE KEYSTONE PORTLAND CEMENT CO. BATH, PA.



OUTPUT: 400 TONS CEMENT ROCK PER HOUR:

FEED: 40 X 30 X 25"

PRODUCT IN ONE OPERATION: 5/8 AND UNDER

POWER CONSUMPTION: 300 H.P. DIRECT COUPLED TO MOTOR - 180 R.P.M.

BUILT IN FIVE SIZES FOR ALL KINDS OF ROCK

POLYSIUS CORPORATION

BETHLEHEM TRUST BLDG.

BETHLEHEM, PA.

MEMBER A.B.C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A.B.P.

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No Interfering Bail!

GOUGE out the big boulders, pick up logs and timbers —there's no interfering bail on the Koehring dipper!

Ready for any job at the command of the control levers — shallow stripping, high bank work, high or low loading, or deep close-in digging! Raise or lower boom at a shift of the lever — no need for adjustments of crowding cables!

Finger Tip ease of control and *independent crowd* that put power behind the dipper, mean big capacity operation! ..... Again we say "Know the Koehring and you'll put great value on Koehring Heavy Duty Construction!" Write for Shovel Bulletin S-29.

Shovel Capacities

Line-of-plate struck measure.

Quickly convertible to crane or dragline.

No. 301—19'–6'' Boom. ⅝ Yd. Dipper on 19' Dipper Sticks; ¾ Yd. Dipper on 16' Dipper Sticks; 1 Yd. Dipper on 14' Dipper Sticks

Shock absorber on boom. Wisconsin four cylinder gasoline engine, 5¼" x 6½", 1,000 R. P. M.

No. 501—24 'Boom. 1 Yd. Dipper on 19' Dipper Sticks; 1¼ Yd. Dipper on 16' Dipper Sticks; 1½ Yd. Dipper on 14' Dipper Sticks.

Shock absorber on boom. Wisconsin four cylinder gasoline engine, 6" x 7", 925 R. P. M.

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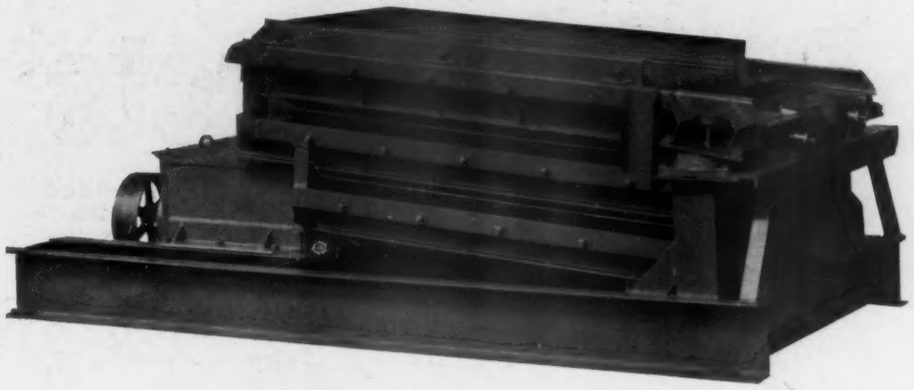

A Triple Deck ROTEX Screen

The Heavy Duty ROTEX Screen shown above has three screen surfaces, each 3 ft. wide and 5 ft. long.

The top deck surface may be clothed with any wire cloth or perforated metal with openings up to as large as 1½ in. in the clear. Naturally, the middle and bottom decks are clothed successively finer, and, all screen surfaces are equipped with the well known ROTEX patent "ball-and-bevel-strip" mesh cleaning system.

The level, circular ROTEX screen motion is a positive mechanical crank motion, exerting a uniform screening effect on each of the three decks in this model, the same that so thoroughly agitates and screens materials traveling over the single and double deck models.

Screens are easily inserted or removed from either side of the machine, and to change one of the screens does not necessitate touching any of the others. As in all Heavy Duty open models, the screen cloths are stretched both sideways and endways, and all screen surfaces are entirely visible from either side while screening.

The nearly level screen position which is practicably employed in ROTEX, brings the overall height down to 44 in., despite the fact that it is built three decks high.

If interested particularly in this new three deck, ROTEX No. 22, write for Catalog No. 81, describing the single and double deck ROTEX, and also mention that you would like to have data covering ROTEX No. 22.

The ORVILLE SIMPSON COMPANY
Office and Factory
1221 KNOWLTON ST. CINCINNATI. OHIO

The Only Paid Circulation Covering the Rock Products Industry

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

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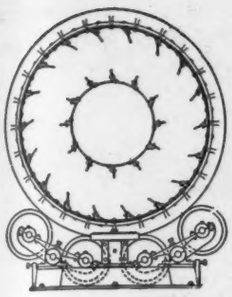
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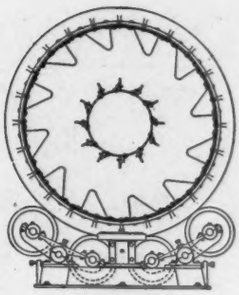
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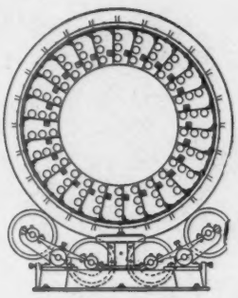
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Our new Chain Catalog No. 416-R makes it easy to select the Jeffrey Chain you need. May we send you a copy?

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The de luxe air drill hose. Oil-proof tube; extra-heavy braided cord reinforcement; double thickness, self-armoring cover.

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Tough and strong, yet light and easily handled. For pneumatic tools and light air drill service. Oil-resisting tube; multiple braided reinforcement.

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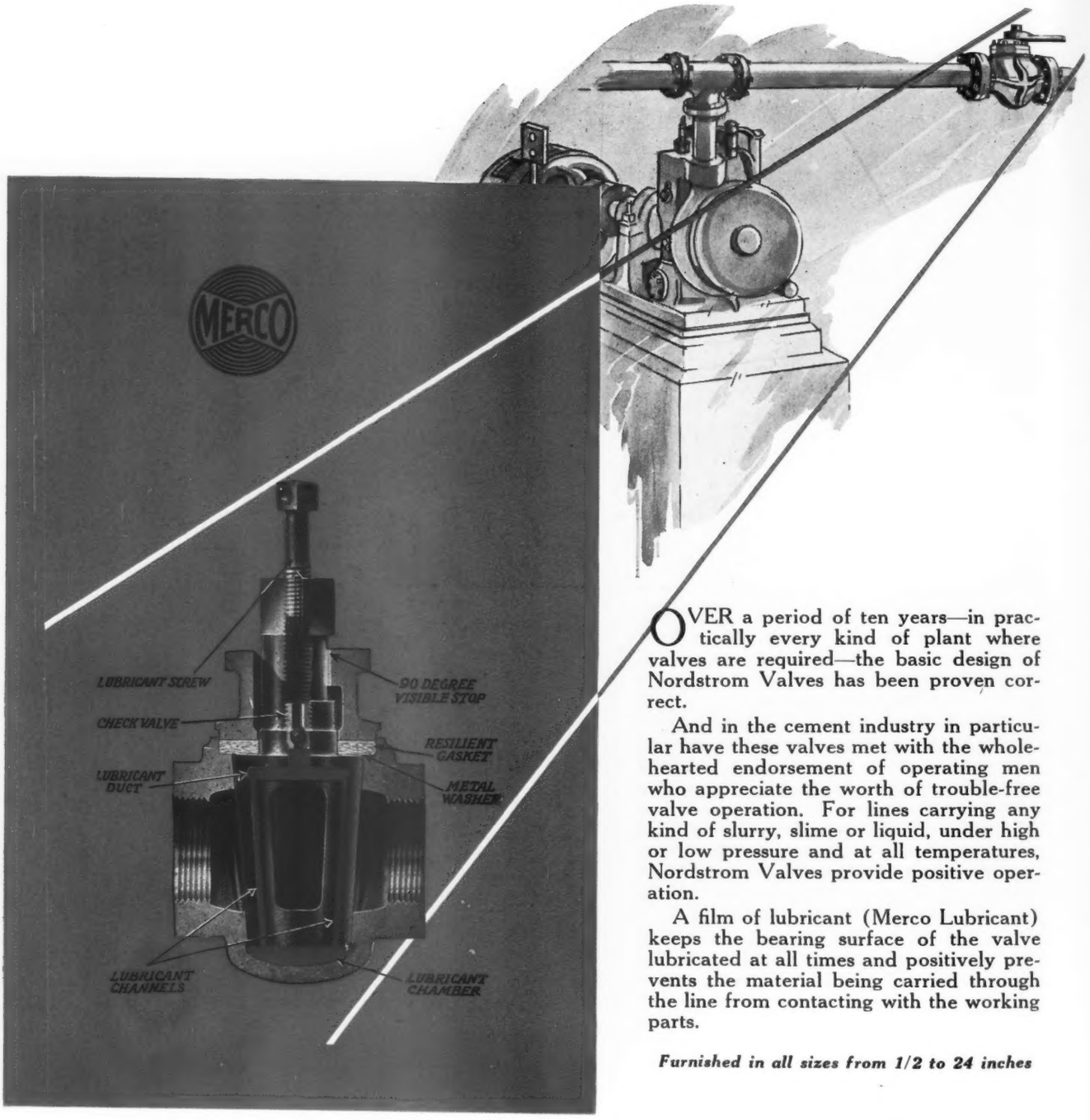
The cover is tough, brawny rubber, 50% stronger than you find on ordinary air hose —it will outwear any kind of steel armoring.

For lowest ultimate cost — Goodrich "Commander" Air Hose!

THE B. F. GOODRICH RUBBER CO.
Established 1870 Akron, Ohio

Goodrich AIR HOSE

"Type 50" "COMMANDER" "Type 88"



OVER a period of ten years—in practically every kind of plant where valves are required—the basic design of Nordstrom Valves has been proven correct.

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A film of lubricant (Merco Lubricant) keeps the bearing surface of the valve lubricated at all times and positively prevents the material being carried through the line from contacting with the working parts.

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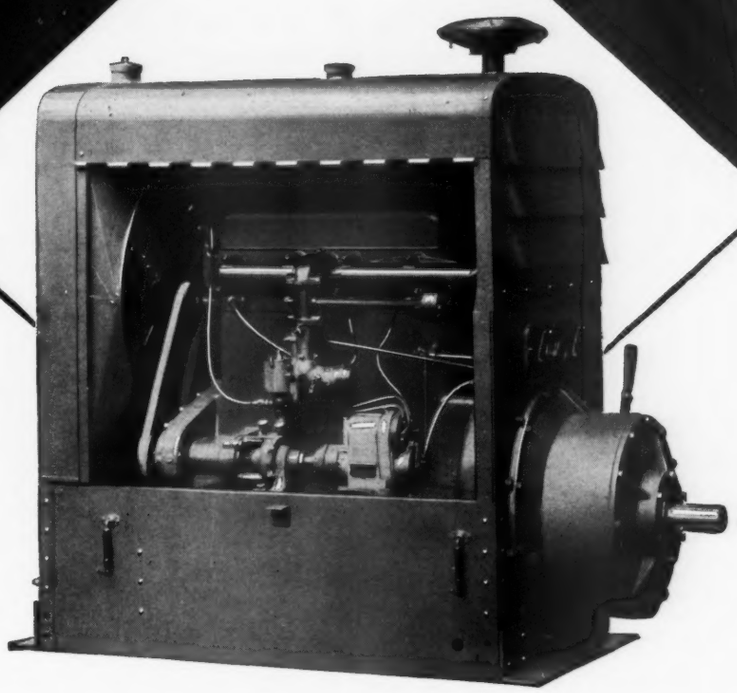

Do you want a motor that keeps on giving "More Power per Cubic Inch"—under the most gruelling conditions—for amazingly long periods without overhaul?

Here is that motor, ready to ***demonstrate***—in any test—that it will improve the performance, economy and "service records" of your product.

A large order, but we stand ready to show proof!

WISCONSIN MOTOR COMPANY
Milwaukee, Wisconsin

Wisconsin Motors are built in a full line of Sixes and Fours, with a power range from 20 to 150 H.P. for construction machinery, trucks and tractors.

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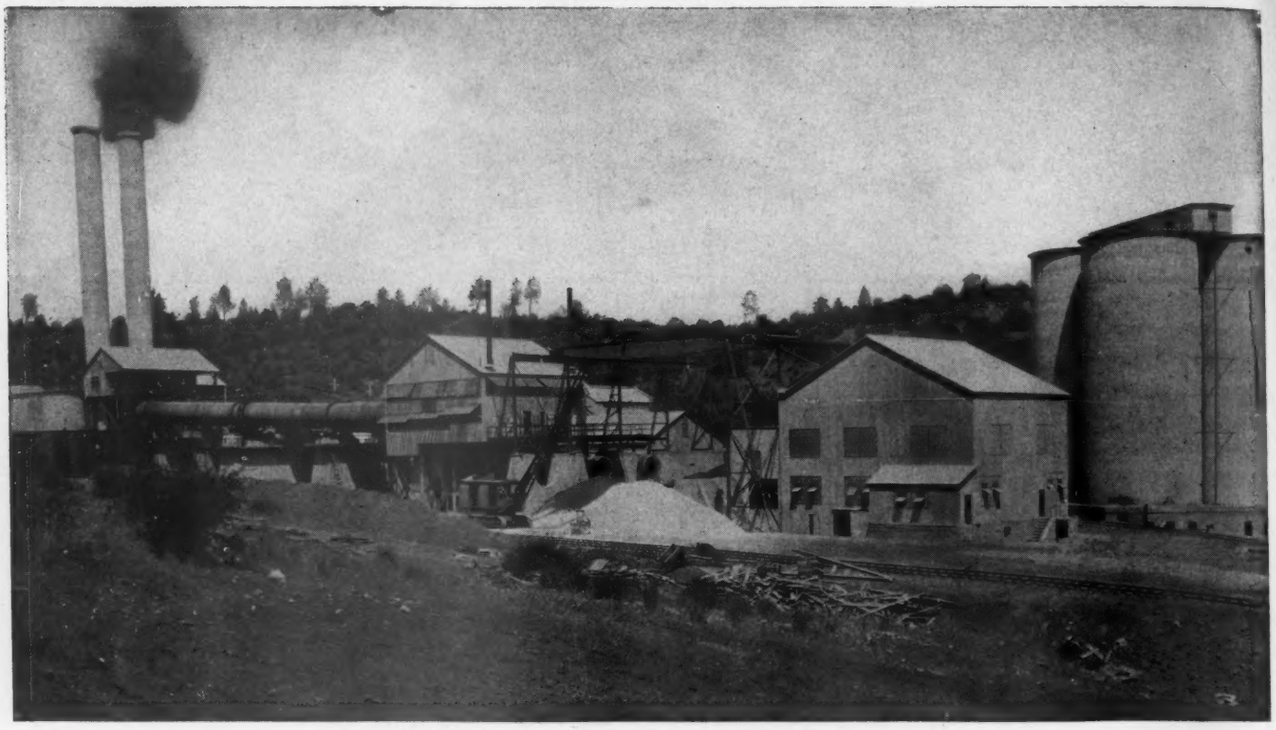

Plant of the Calaveras Portland Cement Company, San Andreas, Cal., operating two Dorr Slurry Mixers

A New Feature Improves Dorr Slurry Mixer Performance

AN ingenious non-plugging air-nozzle now adds to the efficiency of Dorr Slurry Mixers. Slurry cannot back up in the air lines and interfere with the proper operation of the machine.

Dorr Slurry Mixers, combining air and mechanical agitation, give a mixing action in both the horizontal and the vertical plane. There is no stratification in the tank—variations in the composition of the mix can easily be controlled to within 0.2%.

Power requirements average between 1 and 2 H. P. per 1000 cubic feet of tank capacity.

More than 100 Dorr Mixers are now operating at representative wet process plants in all parts of the country.

You will be interested in our Slurry Mixer Bulletin No. 1171. Our nearest office will be glad to send you a copy.

Manufacturers also of the Dorrco Sand Washer and the Dorr Washer.

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It digs wider cuts than its boom length and reduces the capital investment.

It economically strips a heavy overburden to uncover a shallow deposit of sand, stone or gravel, and the same machine is used for loading the material.

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Digs wider cuts.

Keeps always in the most advantageous working position.

Side-steps obstructions.

Reduces capital investment.

Works and moves on surfaces that mire excavators having other types of traction.

MONIGHAN

One of 3 BUCYRUS-ERIE Shovels, 1¾-yd. dipper capacity, loading rock at West Riverside, Calif., for the Long Beach breakwater being built by Hauser Construction Co., Long Beach, Calif. All told, Hauser Constr. Co. has 9 BUCYRUS-ERIES.

Write for our Bulletin describing BUCYRUS-ERIE 2-yd., 3-yd. and 4-yd. heavy duty shovels—giving the facts on the extra power, speed and strength built into these machines.

Even if you don't move mountains out to sea—

20% extra yardage is well worth while!

The largest blast ever shot in the United States brought down a million tons of rock—and a granite mountain began moving toward the sea, to make a huge breakwater for Long Beach Harbor.

The three 1¾-yd. BUCYRUS-ERIE Shovels that pitched in on the loading of this mountain soon made a splendid record. The contract called for 2,500 tons of rock per day; the shovels loaded 3,000.

Extra Output is something that owners of BUCYRUS-ERIE machines have come to take as a matter of course. They have found that these shovels and cranes are built with an extra margin of strength, and are well able to stand over-speeding or double-shifting in an emergency. As Hauser Constr. Co. write: "The service is more severe than any we have known for shovels this size, and no other shovel of any manufacture could do the work with less delay or upkeep expense."

And on the regular run of work, this BUCYRUS-ERIE margin of extra strength gives you Unequalled Reliability, and is your best assurance of Steady Profits.

A Union of Strength

"BUCYRUS" and "ERIE"—each the most successful manufacturer in its particular field—consolidated Jan. 1, 1928. The unmatched resources of BUCYRUS-ERIE assure the buyer of Unequalled Value, More Efficient Machines, Permanence of the Manufacturer, and a More Complete Field Service.

BUCYRUS ERIE

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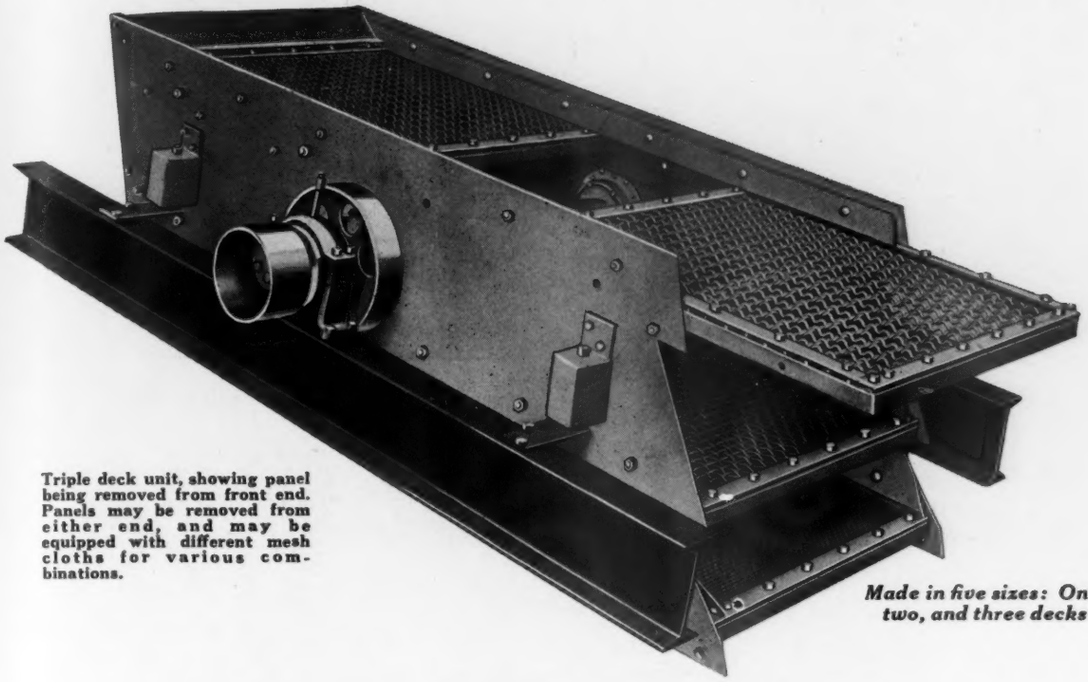
Niagara Counterflow Screens



Triple deck unit, showing panel being removed from front end. Panels may be removed from either end, and may be equipped with different mesh cloths for various combinations.

Made in five sizes: One, two, and three decks

MOHAWK LIMESTONE PRODUCTS CO.
1 East Main Street
Mohawk, N. Y.

The Niagara Concrete Mixer Co., June 11th, 1927.
40 Pearl Street, Buffalo, N. Y.
Attention Mr. W. L. Wettlaufer
Gentlemen:

You have asked us regarding our experience with the installation of Niagara Vibrating screens at our plants at Jordanville and Bloods Mills, N. Y.

Last year we used a 5'x30' Rotary Screen in conjunction with a small 30"x6' secondary Rotary Screen, and were only able, under the best operating conditions, to secure an output of around 75 tons per hour. We desired to at least double our productive capacity and installed to do this work three Niagara Screens, being the initial purchase from you. These Screens have, from the date they started operation, given us a very satisfactory separation and a capacity of at least two and one-half times the Rotary Screens. Under pressure these three Screens would probably give us three times the capacity of our old installation of thoroughly clean stone.

We also have two Screens installed for dust separation to furnish us with kiln and ball mill feed. These two small Screens will handle in the neighborhood of 300 to 350 tons a day with only a power installation of 6 H.P. While we have never tested them out, we are quite sure we can handle 400 tons a day or better with them. We also had a similar Screen installed in closed circuit with the Tube Mill which gave very satisfactory separation. However, we have changed the installation and are now replacing the Tube Mill with a Ball Mill, and will use a duplicate Screen for taking out the fine material and returning the over size to the mill.

I think the best indication of our satisfaction with Niagara Screens is the fact that we started out with an original installation of three Screens and have since purchased six additional, so that we are now operating nine of your Screens.

We are also screening agricultural lime on a twenty-four hour operation with your Niagara Screens.

With kindest personal regards and best wishes,

Yours very truly,
MOHAWK LIMESTONE PRODUCTS CO.
L. A. Poston, General Manager.

LAP:R

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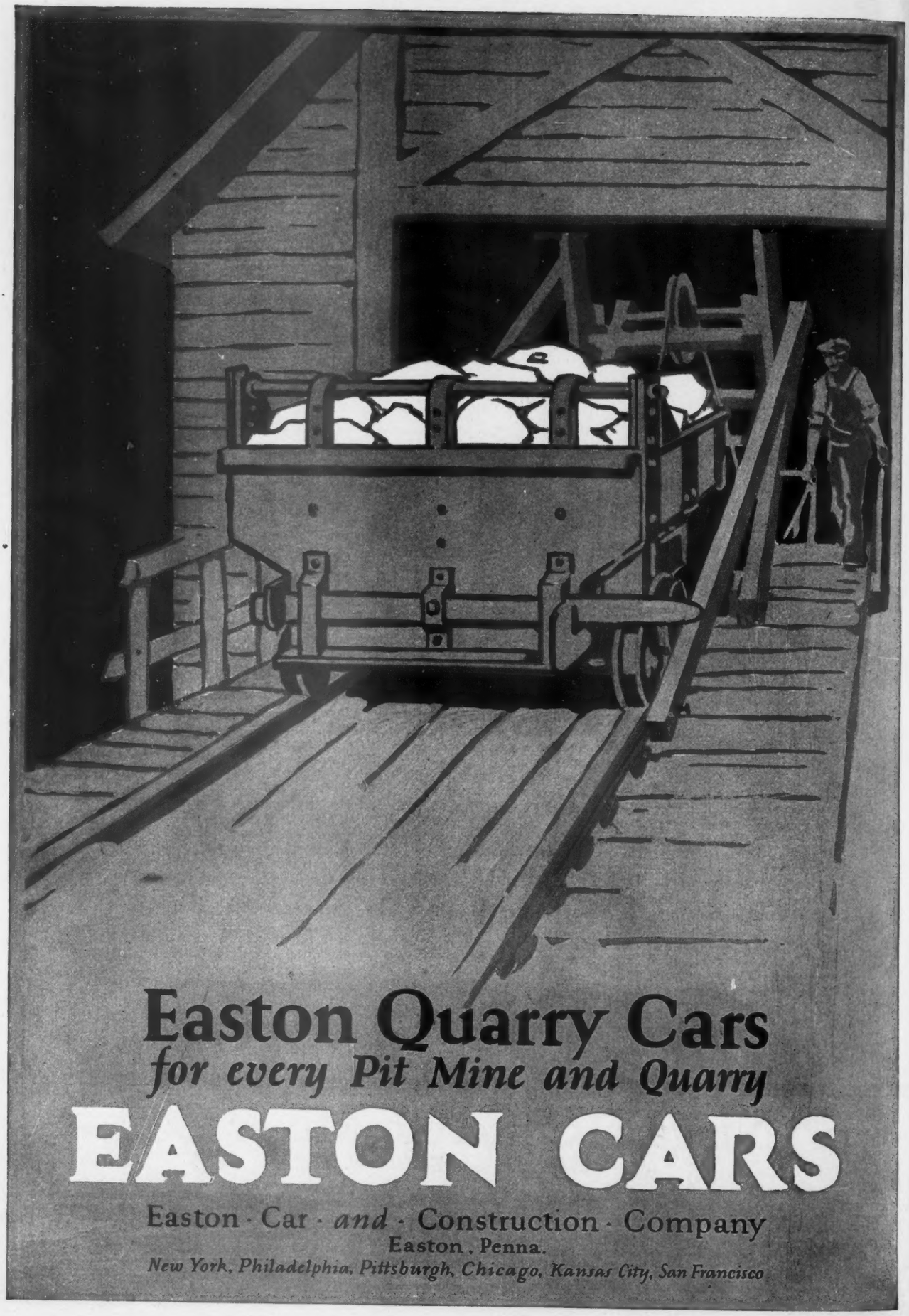
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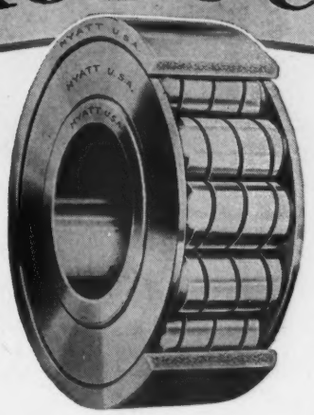

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Make metal mining safer — *use more light*

SAFETY engineers and mine operators are continually striving to reduce the number of accidents in metal mines. Safer working conditions underground is a subject of constant study.

Government reports show that the majority of under-ground accidents in metal mines occur at the face, caused by roof falls and the movement of loose ore. Flood lighting can help prevent these accidents by illuminating dangerous conditions before an accident occurs.

The Carbic Flood Light

The Carbic Flood Light is ideally suited for use in metal mines. Experiments carried on during the past year in a large number of these mines in various sections of the country have proved the advantages of the Carbic Flood Light when used in addition to miners' cap lamps for under-ground illumination.

One Carbic Light will brightly illuminate the highest stope. Large boulders on the slope are easily seen and the roof can be carefully inspected. Even in stopes filled with fog, a Carbic Light will adequately illuminate the working area. Miners can work directly facing Carbic light because there is no glare.

Other Uses for the Carbic Light

While the greatest need for the Carbic Light is in the stopes, it is also useful for haulage roads, shaft stations, underground shops and various other places where a self-contained flood light is required. Quarries and strip mines will find the Carbic Light makes night work safer and more productive.

CARBIC

Used for 14 years on the surface

THE Carbic Light has been used on the surface by contractors for more than 14 years. Thousands of Carbic Lights are supplying dependable illumination for night construction work. It is the standard portable flood light.

The Carbic Light is extremely simple. There are only three parts. It can be charged in three minutes. It is truly portable. It can be easily carried from stope to stope. It is absolutely safe. If it is knocked over, the water runs out and the generation of gas stops immediately. The flame will not blow out. The Carbic Light is listed as standard by the Underwriters' Laboratories, Inc. It is economical to operate. Gas is generated only as desired.

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Cadet Light

Supplies adequate light for small stopes, roof trimming and shaft stations. Weighs only 16 lbs. empty and 30 lbs. charged. Burns 5 hours on one full charge. The operating cost is 5 cents an hour.

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For illuminating large stopes. Weighs 37 lbs. empty and 115 lbs. charged. One full charge is sufficient for 12 hours of continuous use. Costs 6 cents an hour to operate.

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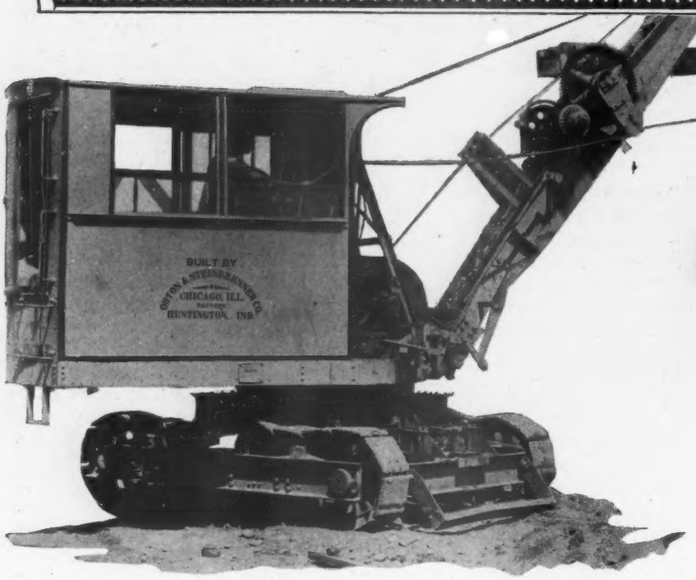

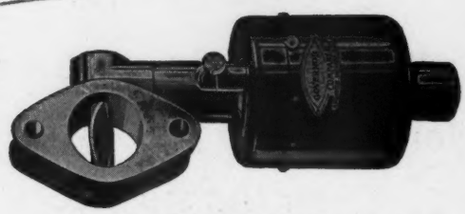

The ORTON Shovel is Pierce Equipped

The engine of this famous shovel is protected by a PIERCE GOVERNOR to assure every buyer greater service, longer life and lower operating costs. Over 350 manufacturers use PIERCE GOVERNORS.

Give Your Power Equipment the Protection It Deserves!

Production is profit! Delays cost dollars! Protect your power engines with dependable PIERCE GOVERNORS and you'll keep them on the job all the time.

By protecting the engine against stalling and racing as power loads are suddenly applied or released, PIERCE GOVERNORS protect every moving part—saving fuel, cutting repair and upkeep costs, increasing operating efficiency and prolonging engine life 200% to 400%.

And protection is not all! PIERCE GOVERNORS speed your work by assuring a smooth, even flow of power at all times—no matter how tough the going.

That means protection and production that result in real profits for you!

Let us show you what PIERCE GOVERNORS are doing for other operators—and what they will do for you. Send for your copy of our booklet No. 120.

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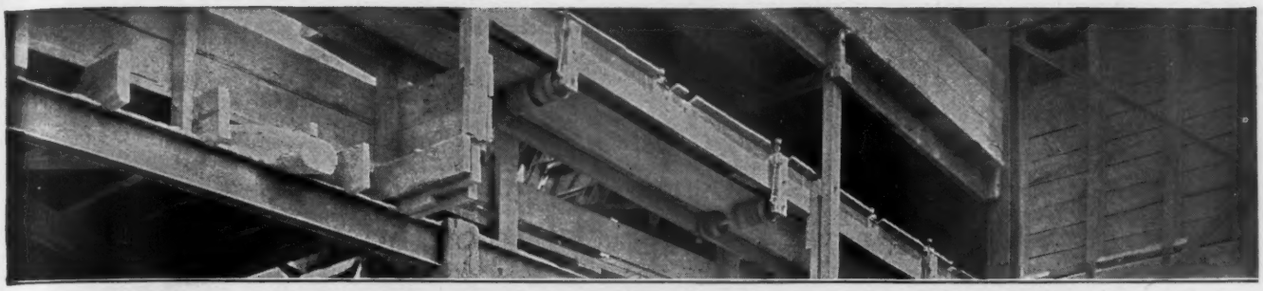
World's Largest Governor Builders

Pierce Governors *for Automatic Speed Control*



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The right way to get the right belt or other mechanical rubber goods for your plant is to analyze the requirements of the job and have the equipment specified and built to the duty required.

That is the way Goodyear Mechanical Rubber Goods are specified by the G. T. M.—Goodyear Technical Man.

The result is that Goodyear Belts, Hose, Valves and Packing always give most efficient service and long, economical, trouble-free wear.

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GOODYEAR

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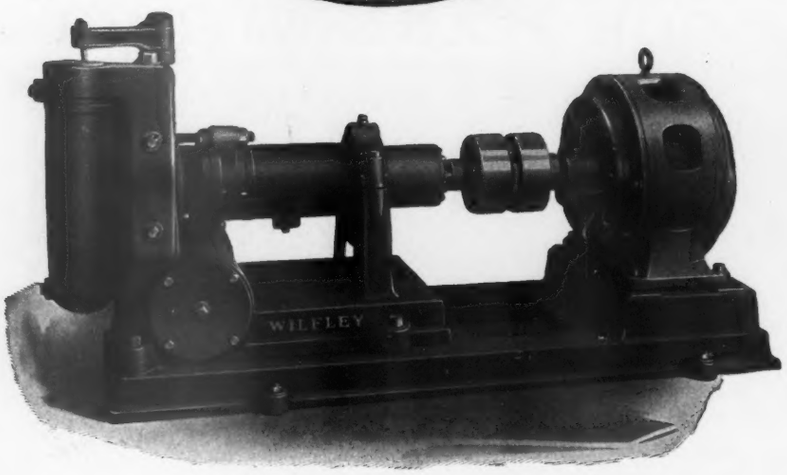

Meeting the Demands of the Cement Industry

IN the Cement Industry the Wilfley Pump has proven remarkably well adapted to handling the slurry and wash mill clay in wet process plants, and in general has been successfully applied to transferring the slurry from grinding mills, storage tanks, mixing basins, and for kiln feeding.

The Wilfley Pump possesses features of design that engineers consider the most important improvement in slurry pump construction yet devised. A patented centrifugal seal that has successfully done away with the troublesome stuffing box, is one feature that alone is worthy of every operator's consideration.

Let our engineers figure with you on your slurry handling requirements.

WILFLEY Centrifugal SAND PUMP

PATENTED

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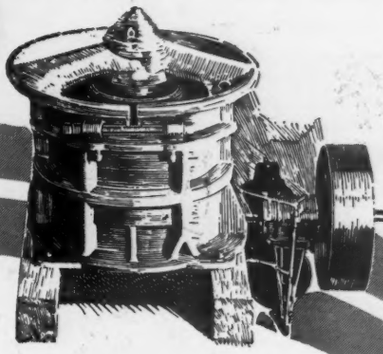
crushes blast furnace slag —tramp iron and all



Slag from the steel mills around Birmingham, Alabama, just as it comes from the blast furnaces—with plenty of tramp iron in it—that's the stuff a Birmingham corporation* has been feeding to Telsmith Crushers for considerably over a year—and "obtaining excellent results", to quote the user's own words.

It was Telsmith's ***steel*** construction and immunity from breakage by tramp iron that influenced this corporation to purchase their first Telsmith, a No. 3F Reduction Crusher. It more than made good on this tough job—giving such thorough satisfaction that a Telsmith 16-A Primary Breaker was purchased to team up with it.

Don't think that Telsmith had no competition on this job. Other crushers were tried first—there was ample opportunity for comparison. But both ***Telsmiths*** — primary breaker and reduction crusher—gave these users the "best results of any crusher ever used".

Wouldn't you like to have ***all the details*** of Telsmith's many advantages and the famous Telsmith Guarantee against breakage by tramp iron? Catalog 166 (Telsmith Primary Breaker) and Bulletin 2F11 (Telsmith Reduction Crusher) mailed free on request.

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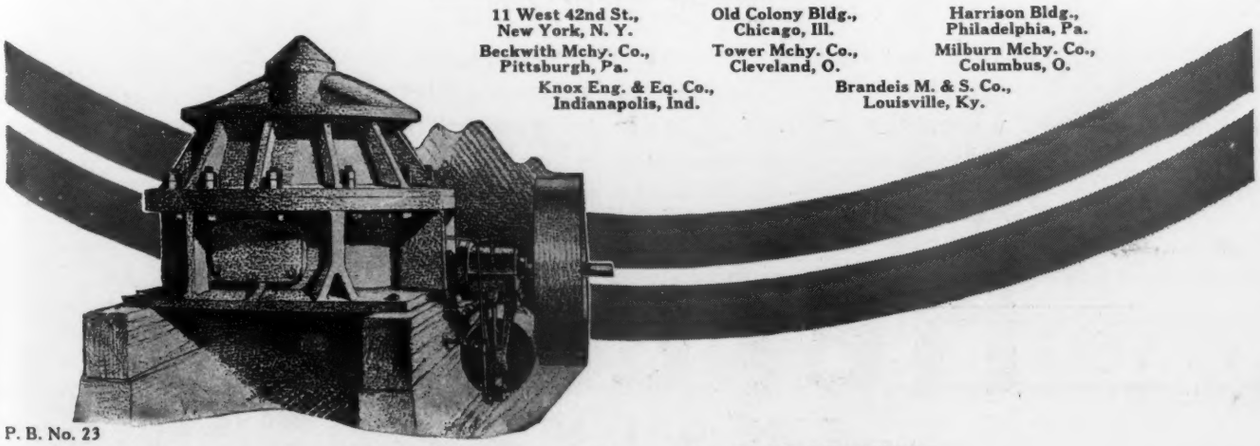

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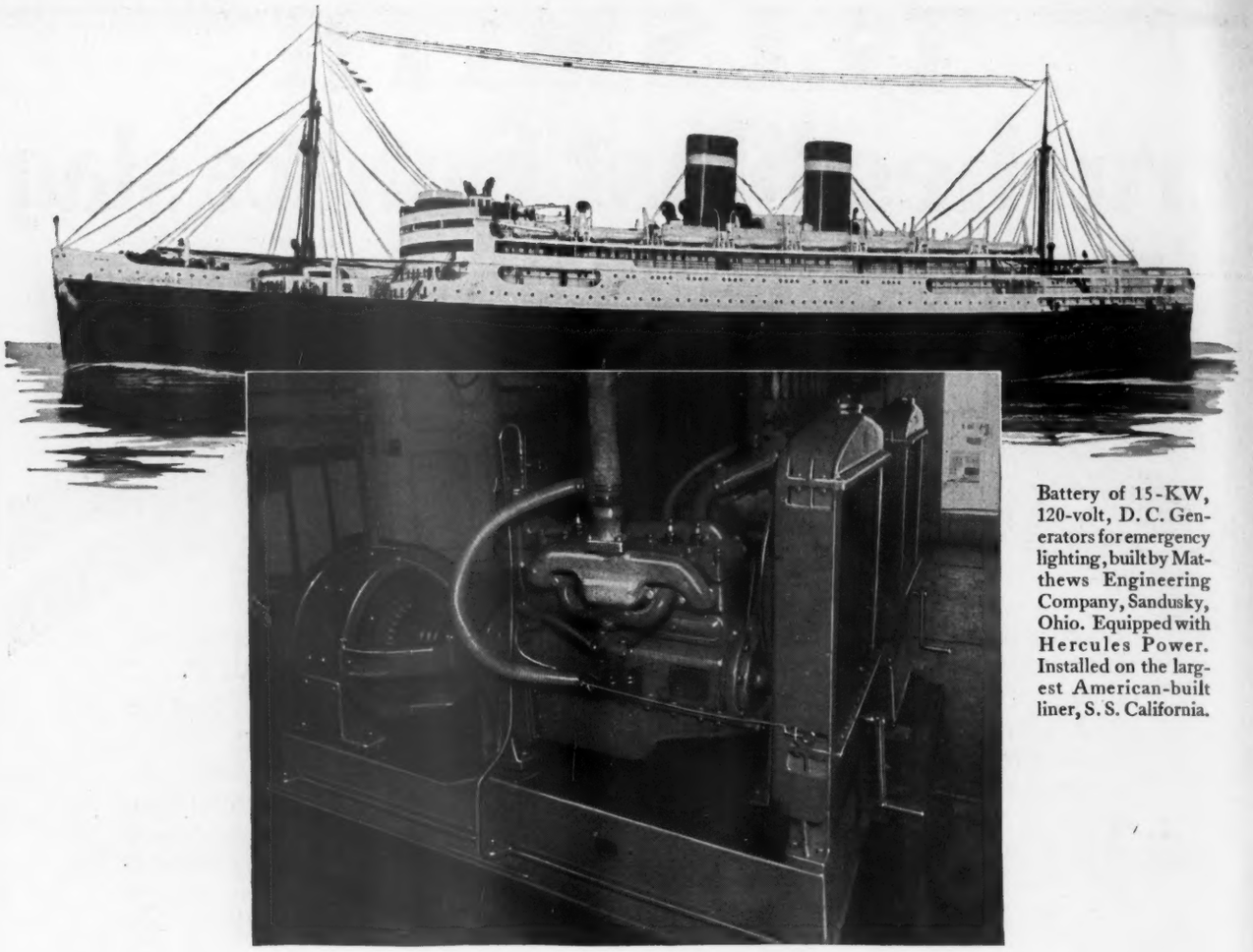

Battery of 15-KW, 120-volt, D. C. Generators for emergency lighting, built by Matthews Engineering Company, Sandusky, Ohio. Equipped with Hercules Power. Installed on the largest American-built liner, S. S. California.

Hercules Goes to Sea

Every industry is familiar with the exceptional performance of Hercules Engines. Road Building, Oil Production, Farming, General Contracting and Commercial Transportation know the reliability and endurance that are typical of Hercules Power.

A product of such universal usefulness can be the result solely of seasoned technical knowledge combined with manufacturing skill of the highest order.

Whether the requirement is for an engine of the six-cylinder or four-cylinder type, there is a Hercules model within the range of 20 to 115 horsepower, that will provide the very safest investment in satisfactory power.

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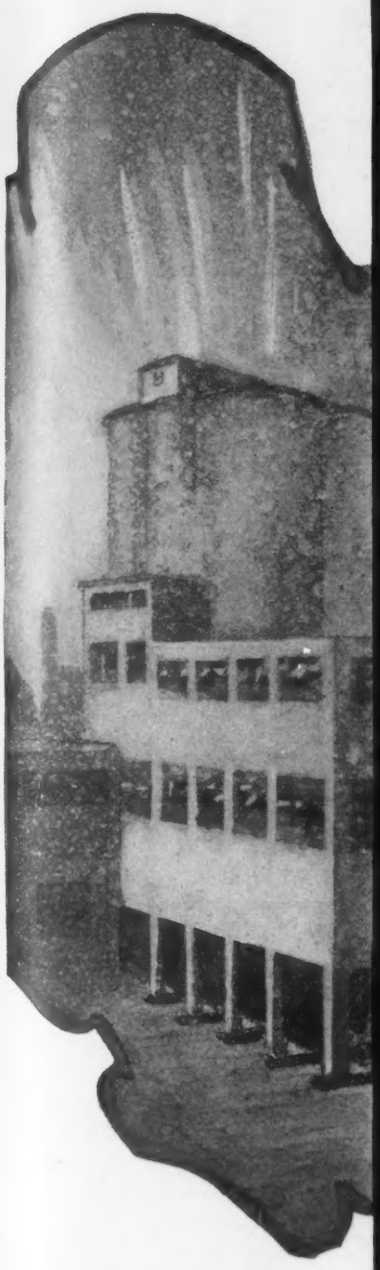

Dust Collection

at Baggers Bag Cleaners

—ventilating Finish Grinding Mills, Conveyors, Screens— Cooling Cement

SLY Dust Arresters serve these many purposes in cement plants. Hundreds of Sly Arresters are now installed in nearly one hundred cement plants.

Dust formerly wasted is bagged and sold; bag cleaning time is shortened; working conditions are improved; machinery maintenance is greatly decreased because the diamond-like cement dust is arrested at its source.

If you have a dust problem in any part of your plant, or you desire to ventilate your Finish Mills, Screens, Conveyors—or Cool Cement after it is ground, write. A Sly Engineer will call and give you practical suggestions regarding the necessary dust arrester equipment.

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The W. W. Sly Manufacturing Company

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Established 1874

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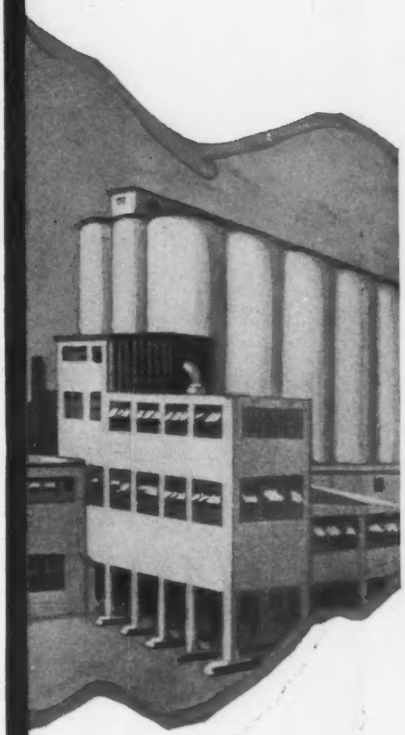
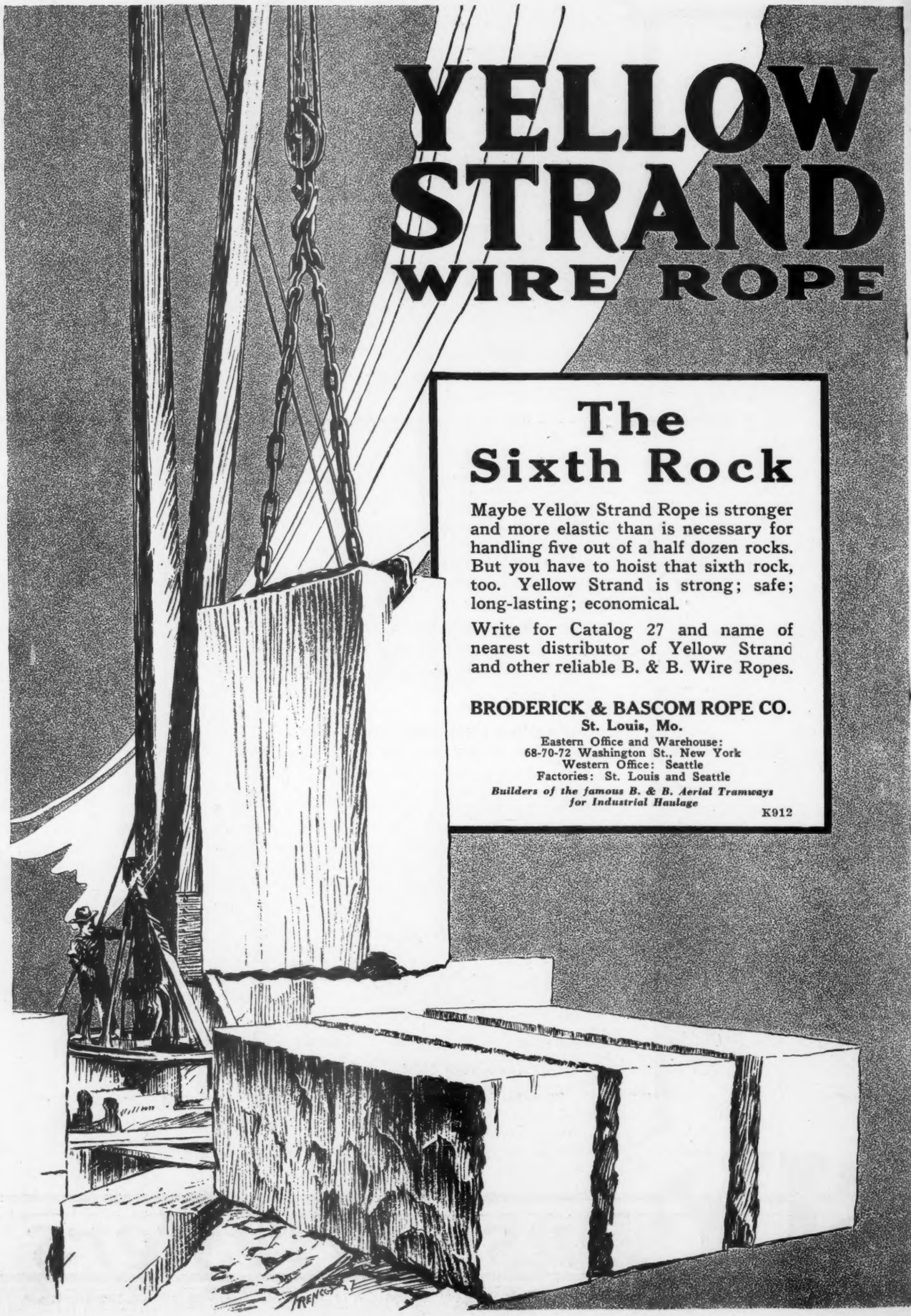


SLY *Dust Arresters*


YELLOW STRAND WIRE ROPE
The Sixth Rock
Maybe Yellow Strand Rope is stronger and more elastic than is necessary for handling five out of a half dozen rocks. But you have to hoist that sixth rock, too. Yellow Strand is strong; safe; long-lasting; economical.
Write for Catalog 27 and name of nearest distributor of Yellow Strand and other reliable B. & B. Wire Ropes.
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New Explosives Saving 11% to 15%

AT a cement company's limestone mine in western Pennsylvania, Hercomite 4 has replaced 40% Extra L. F. Gelatin. Performance and fumes are as good as with Gelatin. The saving on explosives amounted to 1½ cents per ton of stone mined, or over 11%.

A large iron mine in Minnesota has adopted Hercomite 3 in place of 50% Extra L. F. dynamite; and at another similar mine Hercomite 4 has replaced 40% Extra L. F. dynamite. In each instance performance and fumes were satisfactory and the saving was over 15%.

HERCOMITE 2 is nearest grade to	60% Extra L. F. or 40% to 50% Gelatins
HERCOMITE 3 is nearest grade to	50% Extra L.F. or 30% to 35% Gelatins
HERCOMITE 4 is nearest grade to	40% Extra L.F. or 25% to 30% Gelatins
HERCOMITE 5 is nearest grade to	30% Extra L. F.
HERCOMITE 6 is nearest grade to	25% Extra L. F.
HERCOMITE 7 is nearest grade to	20% Extra L. F.

HERCOMITES 2 to 7, that are reducing costs wherever they are introduced, should not be confused with the regular Extra and Extra L. F. grades. They replace these grades as well as the Extra L. F. Gelatins, because they represent the greatest explosives value we have ever offered.

Cartridge counts in 1¼" x 8" size range from 240 for Hercomite 2 to 350 for Hercomite 7 per 100 pounds. The strength of 100 pounds of explosive is the same for all of the Hercomites in the series, but because of the different cartridge counts to the 100 pounds for each of the different powders the cartridge strength runs from 20% in Hercomite 7 to 50% in Hercomite 2. And the cost per cartridge is the lowest ever offered the trade for equal explosive value.

Write for prices and booklet.

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Hercules Powder Company, Inc.
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Please send me additional information regarding the new Hercomites, No. 2 to No. 7.

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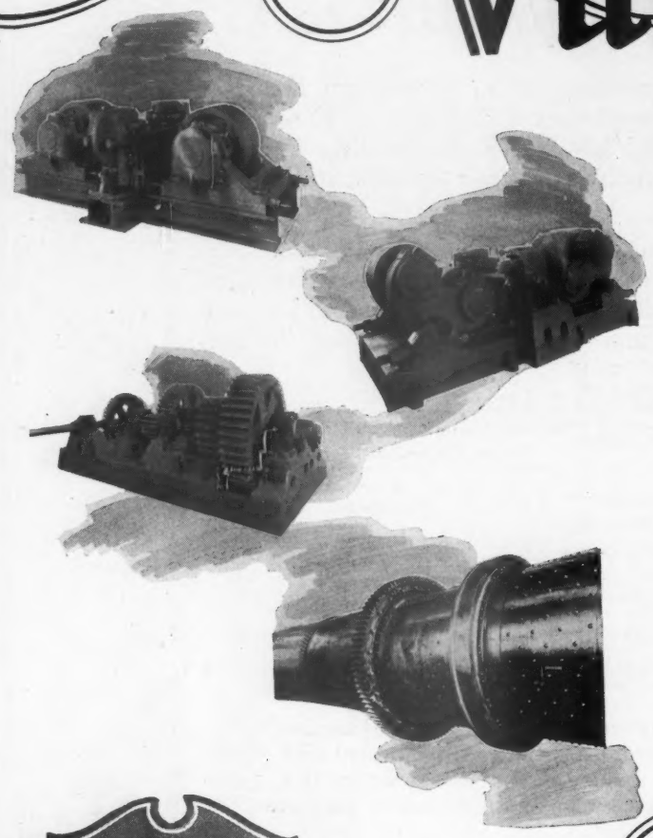
Vulcan Kilns Coolers and Dryers ~



Built Complete in Vulcan Shops ~

From the raw material to the finished product, Vulcan Kilns, Coolers and Dryers are made entirely in Vulcan plants. This includes the production of iron, steel and brass castings, as well as the fabrication of all steel plate work.

Right at the beginning—in the selection of raw materials—Vulcan quality standards are rigidly observed. And through all manufacturing processes the same high standards prevail. All castings are made under laboratory supervision, and designed and built to fulfill the most exacting requirements. Castings are heat-treated in accordance with special formula to insure satisfactory performance for each particular duty.

This complete control of every step in the manufacture of these units explains in part, the unsurpassed performance, long-enduring service and wide preference for Vulcan Kilns, Coolers and Dryers, and why Vulcan Equipment once used, is ordered again and again.

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Hoists,
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Ask for bulletin describing the type of equipment in which you are interested.

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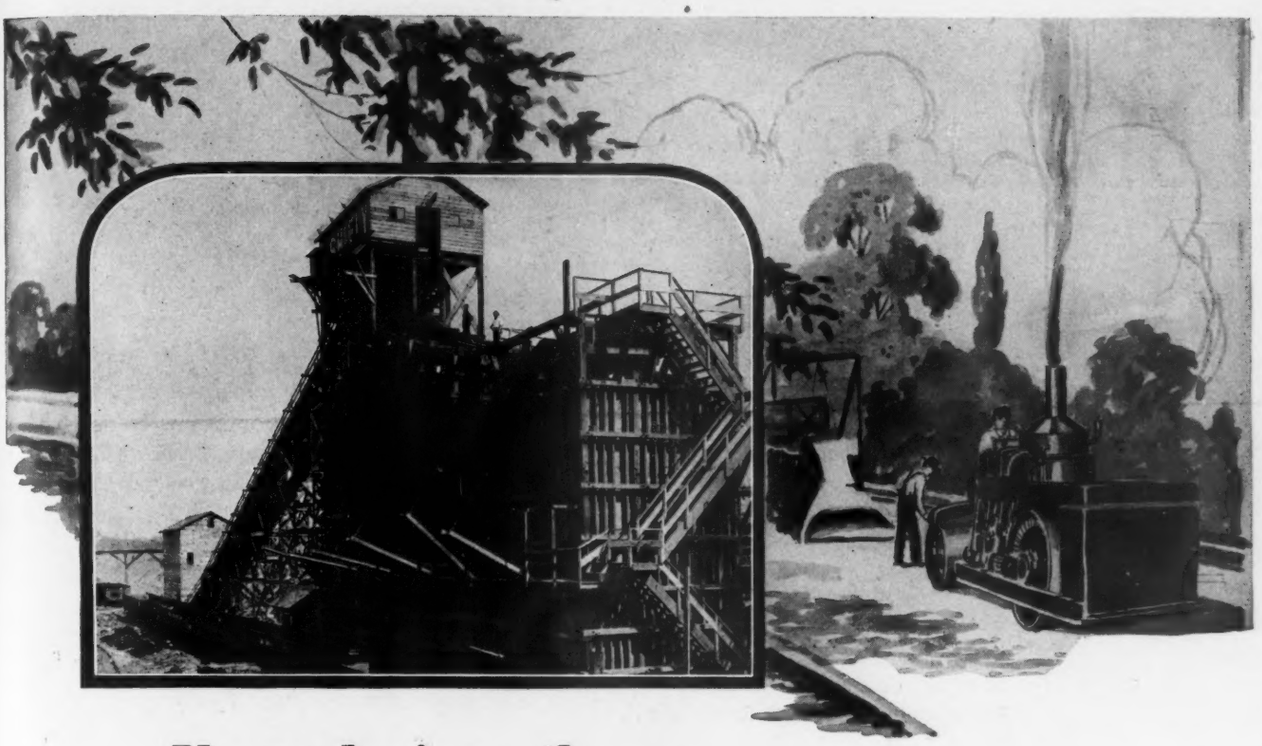

Yesterday's trails are tomorrow's highways

EVERY progressive community has its "better roads" program, for trade follows the automobile today.

What a wonderful opportunity this is for the sand and gravel business!

This demand, handled efficiently and economically spells only one thing—steady prosperity.

Link-Belt equipment assures success and satisfaction. Our engineers can solve your gravel pit problem just as they have solved the problems of others.

Let them help you. Get the benefit of their vast experience.

There's a great satisfaction in having the right machinery and equipment.

We have prepared a special catalog for you. It describes the latest improvements we have made in our sand and gravel screening, washing and handling equipment. Ask for book No. 540.

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The tremendous weight of cement mill machinery, as compared with that used 10 and 20 years ago, brings up problems in lubrication that operators did not have to face in those days.

Present day production methods necessitate the continuous flow of materials from one department to another. If each piece of equipment does not do its part without interruption, costly delays occur.

As in other industries, the Vacuum Oil Company has developed worthwhile economies in the lubrication of cement mill machinery.

Past lubrication methods have been inadequate, in many cases, on this heavy machinery. Here are some of the more tangible objections to the old methods:

1 The lubricant tends to carbonize and form glossy surfaces that keep it from flowing freely into the bearing. Consequently—

2 Bearings must be watched to make sure that they do not heat up.

3 Carbonacious deposits plus foreign material often get into the bearing and score its surface.

4 In starting machines cold the solid lubricant does not function until it warms up. Metal to metal friction, depreciation of bearings, and excessive power consumption result.

5 There is a perceptible "drag" on the line that causes a power loss.

A study of these conditions leads to the conviction that economies can be effected on many types of machinery by substituting correctly selected oils and greases in place of present lubricants. Some of the advantages from such a change are:

A power saving.
More continuous operation.
Less time out for repairs.
Lower maintenance and repair costs.
Lower labor costs for oiling.
Ultimate lower lubrication costs.

This is not fine-spun theory. It is the result of actual experience in large cement mills. In these mills Gargoyle lubricants, properly applied, have shown an appreciable saving in lubrication costs per barrel of cement.

Vacuum Oil engineers will work with you in selecting the correct lubricant for each specific purpose. Gargoyle lubricants are especially recommended because of their high lubricating qualities. There is a correct grade for every lubricating need in your mill. Let one of our engineers call on you.

GARGOYLE

Lubricating Oils

The World's Quality Oils
for Plant Lubrication

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Branches and distributing warehouses throughout the country

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Cheap Fuel with P&H Diesels

Cold Start 4 Cylinder

Model 700 Diesel 1¼ Yds. Capacity

Model 600 Diesel 1 Yd. Capacity

THE P&H Diesel Excavator has a full-Diesel motor (not semi-Diesel) that burns a low grade of fuel oil costing only 5 to 8 cents per gallon. The fuel consumption is small, the one yard machine using only 18 to 20 gals. of oil per 9 hr. shift in heavy service and the 1¼ yd. machine, 24 to 26 per shift. This engine is a proved success adopted by P&H after more than 4 yrs. of development work with various makes of engines.

We foresaw the coming of the Diesel years ago and in designing our present line of machines adopted *massive Unit Steel Castings* for the main frames which form a firm foundation for these large, powerful Diesel Motors.

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HARNISCHFEGER CORPORATION
Established in 1884
3865 National Avenue, Milwaukee, Wis.

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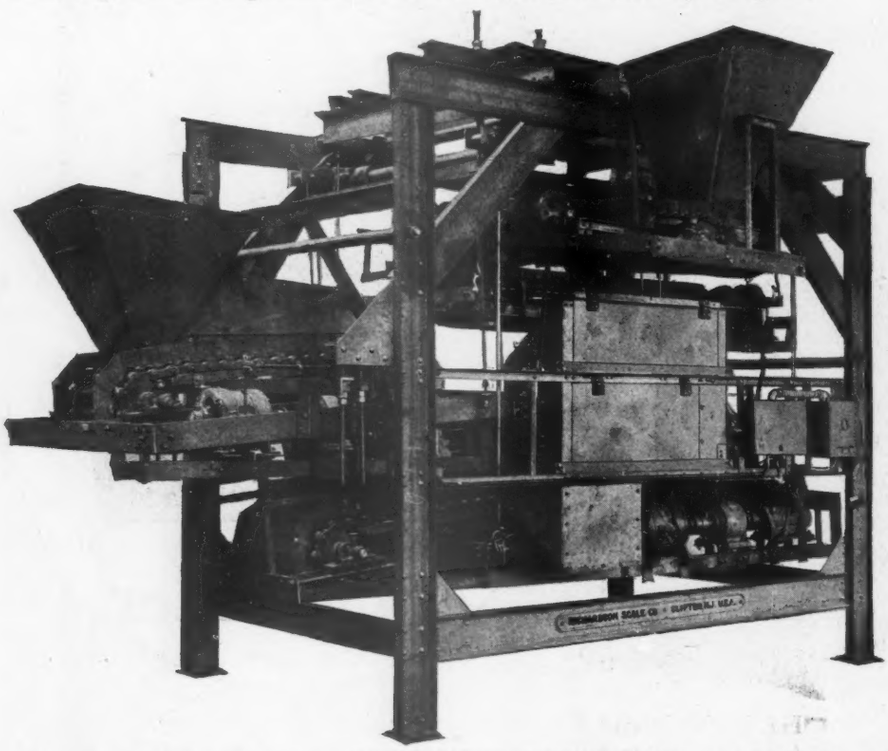
P&H

Why Not Mix by *Exact Weight*

and be sure your cement is right?

Measurement and guesswork often mean spoiled cement, complaints from customers and heavy loss.

Use the RICHARDSON self-operating "CONVEYoWEIGH" and enjoy the repute and profit of cement that's always right.



One "CONVEYoWEIGH" is used for each ingredient—limestone or clay—hot or cool clinker or gypsum. It conveys and ***weighs*** a ***definite weight*** or batch and yet ***delivers*** in a ***continuous stream*** from the end of the weigh conveyor and not in a heavy dump.

Combinations of two or more "CONVEYoWEIGHS" are arranged so that the weighed streams from each mingle together ensuring a most accurate and intimate mix. "CONVEYoWEIGHS" are ***self-adjusting*** to varying streams—no errors nor spoiled mixtures.

Self-testing for accuracy—no delusion or doubt!

Built for the heavy duty of Cement Mill operations after 25 years' experience.

Combination and single "CONVEYoWEIGHS" for barytes, coke, bauxite, coal, soda ash, ores, marl, lime, cement, etc. A mechanical weigher for every need.

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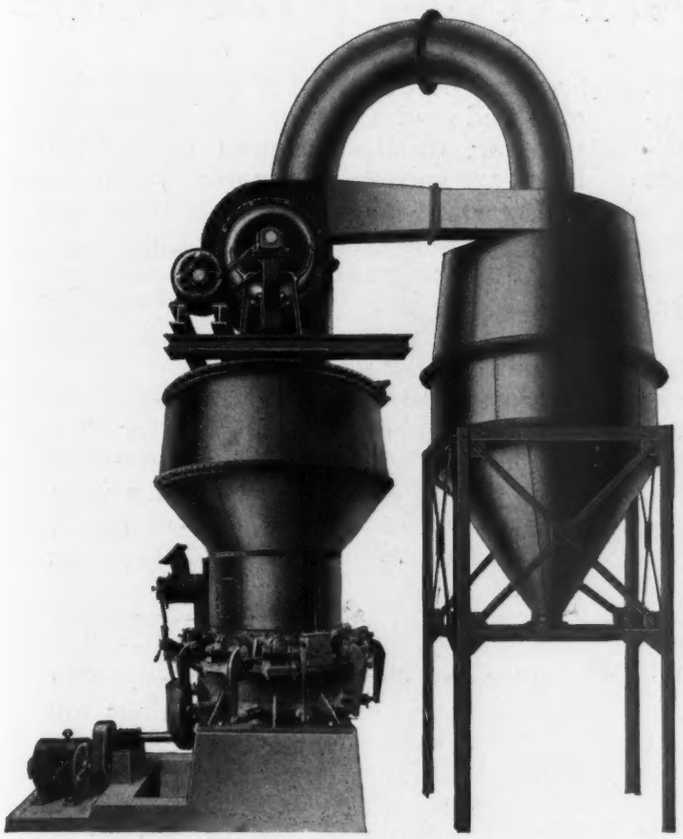
Fine Grinding at Low Cost

The Bethlehem Pulverizer is correct in principle and mechanically efficient. It grinds rocks, ores, ochres, paint pigments and other crystalline materials to any degree of fineness up to 325 mesh.



The Bethlehem Pulverizer is dustless and comparatively silent in operation, gives uniform separation at a constant rate of discharge, and delivers the ground product without the use of elevators, conveyors or auxiliary equipment, direct to the storage bins.

The slow operating speed of the Bethlehem Pulverizer eliminates heating and reduces wear on grinding elements to a minimum, and its extremely low power consumption and maintenance cost, compared with its large output, make it a highly economical mill.

We solicit inquiries from anyone who has a fine grinding problem.

A copy of Catalog J will be sent on request

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BETHLEHEM

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Producing 400 to 500 Cu. Yds. of Gravel Per Day with a 4-Man Crew

When the demand exceeded the plant output, the Stoney Creek Gravel Company, Orland, California, knew immediately how to increase production with no great increase in cost.

The ¾ cu. yd. Sauerman Slackline Cableway, with its cost cutting advantages, paved the way for a 1 cu. yd. Sauerman Slackline Cableway.

Their deposit is a gravel bar in the middle of a stream containing everything from 8 inch "cobbles" on down to sand, averages 35 ft. deep, and calls for a 750 ft. cable span to reach across to the opposite bank of the creek.

The Sauerman mast reaches 122 ft. above ground. This gives the 1 yard Sauerman bucket a return-to-pit speed of around 1200 ft. per minute.

And with the Sauerman 2-speed hoist, the 1 yard bucket digs at the rate of 250 ft. per minute and hauls to the plant at the rate of 750 ft. per minute.

As a result, an entire round trip of the bucket from the farthest digging point to the plant is made in about 90 seconds and the use of intermediate digging and hauling equipment, as well as the men usually required to operate them, are entirely eliminated.

The plant manager writes that this 1 cu. yd. Sauerman Slackline Cableway, when working over a 400 ft. haul, can load 9 cars in 6½ hours. The average production day in and day out is about 10 cars per 9-hour day.

In addition, the Sauerman Slackline Cableway makes it possible for this company to work along on a decidedly small payroll. Only four men are needed to operate the entire plant—and the production runs from 400 to 500 cu. yds. per day.

Sauerman Slackline Cableways are reducing operating expenses and cutting costs all over the country. You can take a trip to these installations and see for yourself how it is done by simply looking through the Sauerman booklet "Excavating For Profit." It is filled with interesting and instructive information.

Send for the booklet, there is no obligation

SAUERMAN BROS., Inc., 430 South Clinton Street, Chicago, Illinois

SAUERMAN

SLACKLINE CABLEWAYS • POWER DRAG SCRAPERS

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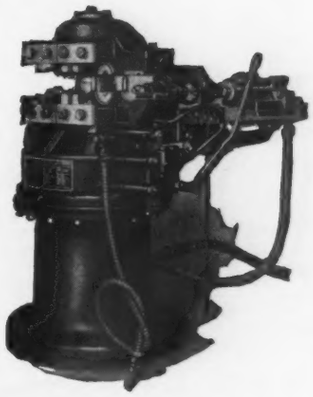
Hand-made Bits Pass in Review

Goodbye, hand-made bits! Farewell, old-timers! You were good friends in the old days, and played prominent parts in the development of the country when Dad was a boy.

But, like the horse and carriage, kerosene lamp, hand pump, and other devices, you are no longer able to compete in the race for economy and production.

It is true, hand-made steels were good steels, but that was in the days of the old piston drill which hit but 200 to 300 blows per minute. The advent of the hammer drill striking from 1600 to 1800 blows per minute made *machine-sharpening* a necessity.

Steels made on "Leyner" Sharpeners are true to shape and size, will cut rock 50% faster, will last longer between sharpenings, and are easier, faster, and cheaper to make. One man with a "Leyner" will do the work of five good hand blacksmiths.



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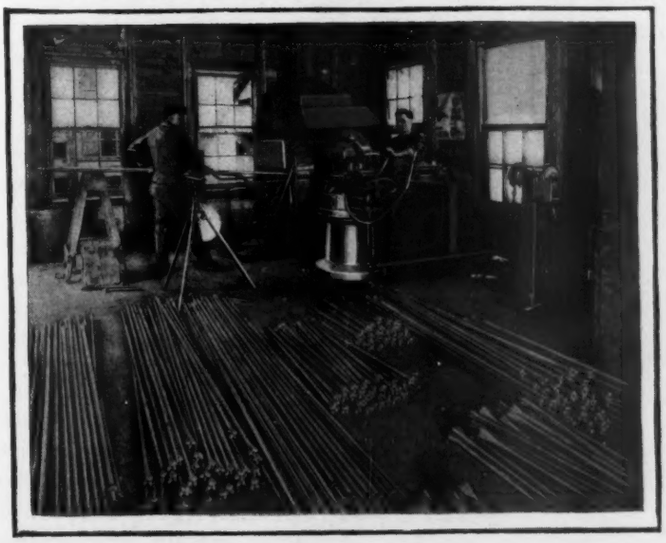

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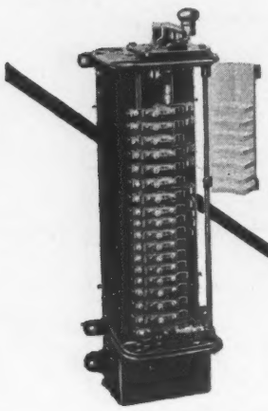
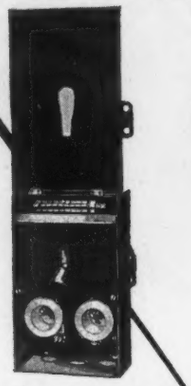
Ingersoll-Rand

For every application

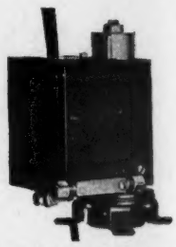


Drum switches for a-c. or d-c. motors driving cranes, hoists, machine tools, compressors, etc

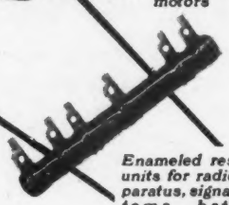
Magnetic switches, with thermal-overload protection, for throwing a-c. motors across the line



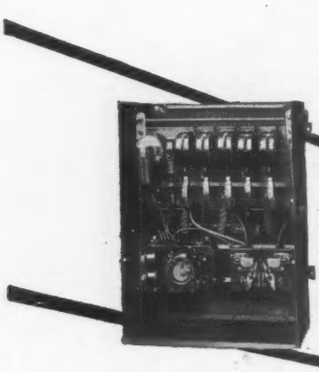
Hand-operated switches, with thermal-overload protection, for starting small a-c motors



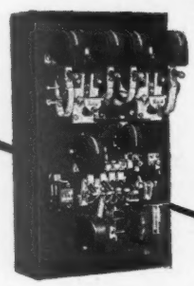
Switches for maintaining predetermined pressure or vacuum—to control small motors driving water pumps, air compressors, or vacuum pumps



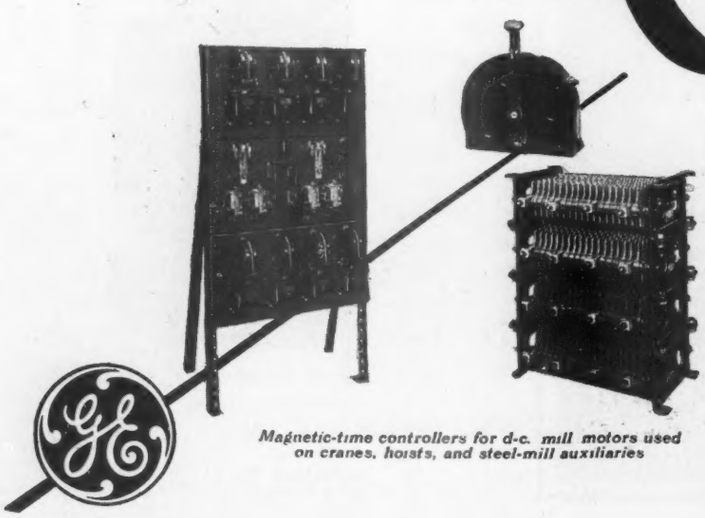
Enameled resistor units for radio apparatus, signal systems, battery chargers, fractional horsepower motors, etc.



Automatic compensators, with thermal overload protection and definite-time acceleration for squirrel-cage motors



Reversing controllers, with definite-time acceleration, dynamic braking, and full-field features, for controlling d-c. adjustable-speed motors



Magnetic-time controllers for d-c. mill motors used on cranes, hoists, and steel-mill auxiliaries

G-E Contr

FROM the complete line of G-E controllers, can be selected a controller for any motor and for any application. Years of experience in the manufacture and application of millions of motors has brought a deep insight into the requisites of good motor control—a practical insight that has been translated into better controllers.

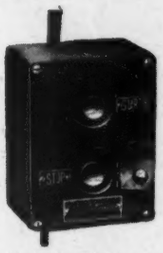
In every G-E controller you will find the most advanced engineering features—features pioneered and perfected by General Electric. Safety—built into every device. Reliable time-limit acceleration—superseding current-limit acceleration.

GENERAL

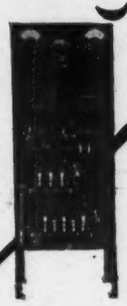
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

in every industry

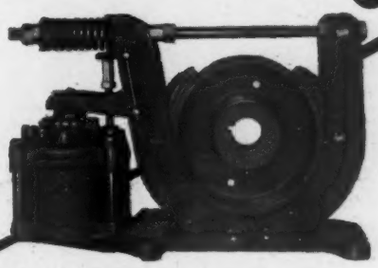
G-E controllers



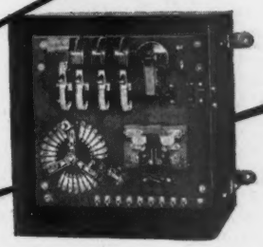
Push-button stations—available in sizes and forms for all types of magnetic controllers



Synchronous-motor starters—push-button operated—field automatically applied



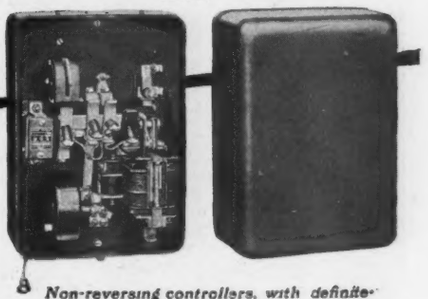
A-c. or d-c. shoe-type, spring-set solenoid brakes for floor or motor mounting—for holding loads and for quick stopping



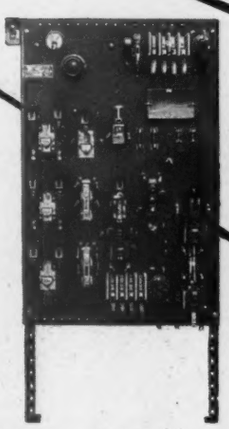
Speed-regulating, primary and secondary controllers for wound-rotor motors driving ventilating fans and blowers

Solenoids—push or pull or a combination of both—interchangeable for alternating current or direct current

Float switches for motor-driven pumps to maintain a predetermined water level



Non-reversing controllers, with definite-time acceleration and dynamic braking, for controlling d-c constant-speed motors



Magnetic controllers for d-c. elevators. Similar controllers are available for a-c. elevators

Hand-operated compensators with thermal overload protection, for starting squirrel-cage motors

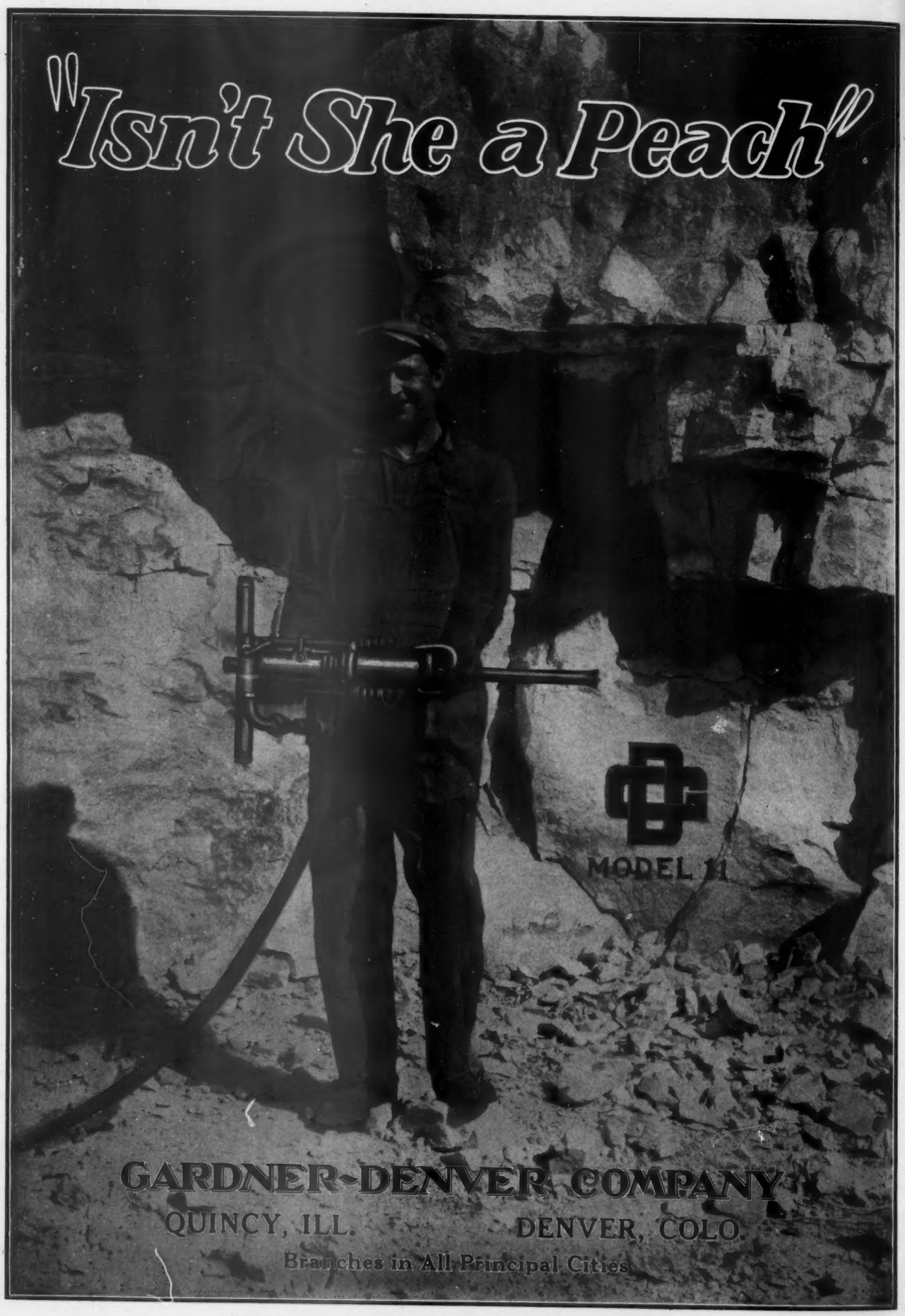
Thermal-overload protective devices—characterized by extreme accuracy and dependability. Time-delay undervoltage release — necessary because of super-power systems. Beauty in shape and color—matching the improved appearance of modern machinery. And, always, smaller controllers for larger motors.

These are typical of the continual improvements that industry has learned to expect of G-E controllers. These improvements and the steadily decreasing price to the user are the results of good engineering and efficient large-scale production.

301-26

ELECTRIC

SALES OFFICES IN PRINCIPAL CITIES


"Isn't She a Peach"
MODEL 11
GARDNER-DENVER COMPANY
QUINCY, ILL.
DENVER, COLO.
Branches in All Principal Cities

"No-Evidence of Wear"

JOHN HERZOG

All Agreements Contingent On Delays Unavoidable or Beyond Our Control

JOHN HERZOG & SON
MANUFACTURERS OF
LIME AND LIMESTONE PRODUCTS
FOREST (HARDIN COUNTY) OHIO

January 3, 1928

Manganese Steel Forge Co.,
Philadelphia, Pa.

Gentlemen:

We have had one 4' section 4" square mesh by 3/4" Rol-Man Manganese Screen in our Allis-Chalmers 72" screen, for about one year now and we see no evidence of wear yet which we believe is proof that this metal is going to be very durable.

We will no doubt later install more sections as the old ones wear out.

Yours very truly,
JOHN HERZOG & SON
By Bert Herzog

TRADE ROL-MAN MARK
DOUBLE LOCK MESH WOVEN MANGANESE STEEL
SCREENS

ROL-MAN Manganese Steel Screens have the toughness, strength and wear-resistance that enable the producer to cross off wear from his list of screen worries. They have other important advantages, too, that eliminate screen trouble and add to the profits of the operation.

In these days of keen competition and customers' strict specifications, profits depend upon maximum tonnages of accurately graded material. ROL-MAN Manganese Steel Screens are designed, and successfully, to meet these present-day conditions.

Make a check-up now on the quality of your product and the per-ton cost of your screening operation. Then, if you find you can benefit from cleaner, more accurate separation, 30% to 40% greater tonnage output and many times longer screen life, install ROL-MAN Manganese Steel Screens and get the greater profits you've been missing.

Prices and full information upon request

MANGANESE STEEL FORGE COMPANY
Richmond St. and Erie Ave. Philadelphia, Pa.
Manufacturers of ROL-MAN ROLLED and FORGED MANGANESE STEEL PRODUCTS

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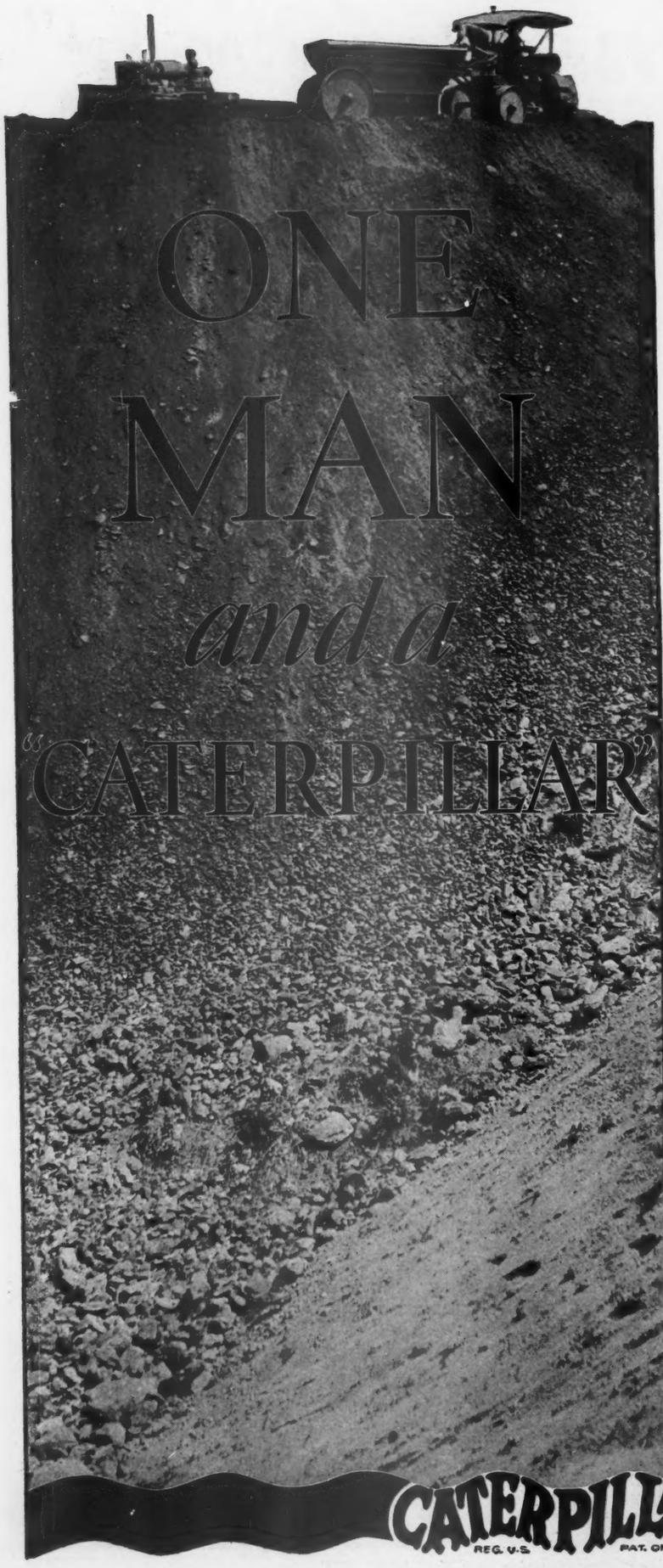


Dump maintenance

costs are cut with a "CATERPILLAR" Tractor and a bulldozer.

?

How many men will such an outfit replace on your operation?

Then picture the other things that "Caterpillar" track-type tractors can do in the quarry . . . transporting overburden, track throwing, taking stone from shovel to crusher, bulldozing spillage, car switching, maintaining roads, removing snow, powering isolated equipment.

And remember "Caterpillar's" reputation for doing things *better, quicker, cheaper!*

There is a "Caterpillar" Dealer near you.

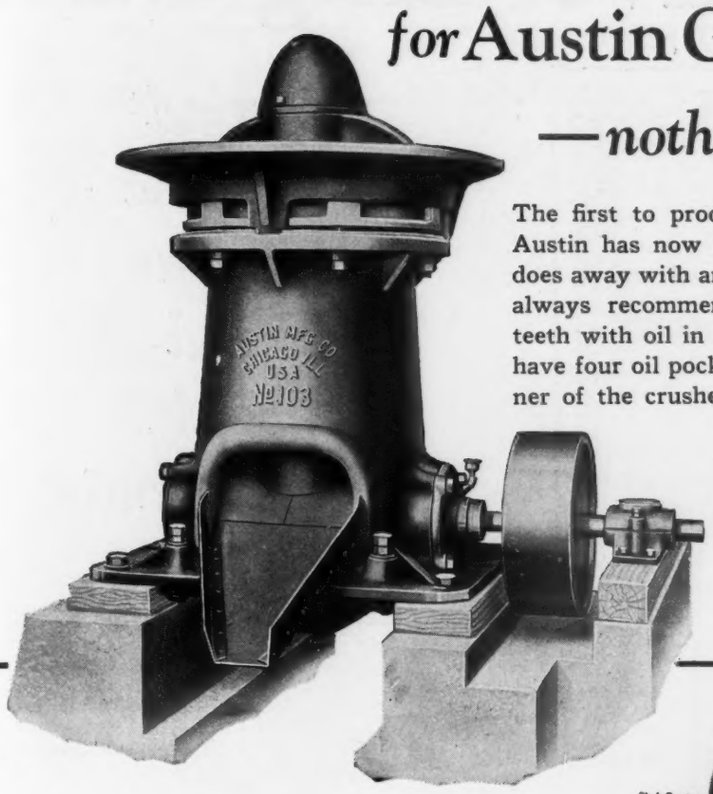
CATERPILLAR TRACTOR CO.
Executive Offices: San Leandro, California, U. S. A.
Sales Offices and Factories:
Peoria, Illinois San Leandro, California
Distributing Warehouse: Albany, N. Y.
New York Office: 50 Church Street
Successor to
BEST C. L. Best Tractor Co. The Holt Manufacturing Company HOLT

2728

CATERPILLAR
REG. U.S. PAT. OFF.

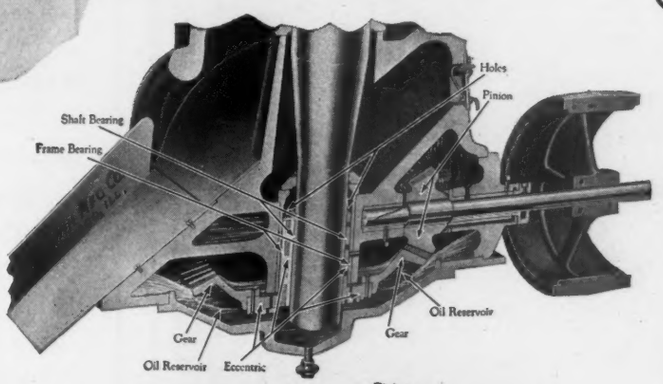
A new pumpless automatic oiling system *for* Austin Gyratory Crushers

—*nothing to get out of order*



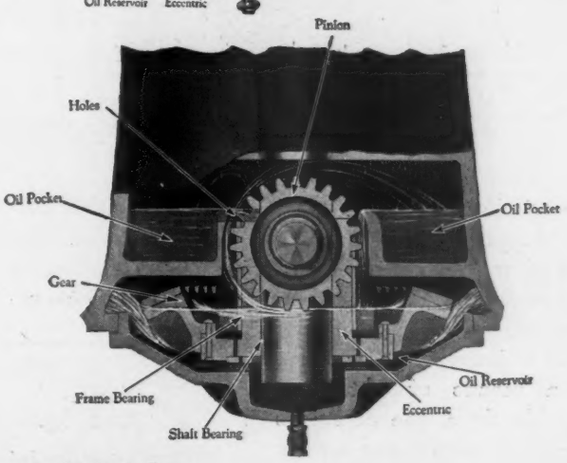
The first to produce crushers with automatic oiling systems, Austin has now developed a new self-lubricating system that does away with any device that can get out of order. Austin has always recommended lubricating the enclosed driving gear teeth with oil in the bottom of the crusher. The new crushers have four oil pockets built into the main frame, one at each corner of the crusher. The turning pinion, and gravity, keep the oil in circulation whenever the crusher is moving.

Austin "100-type" crushers are especially built for reducing hard rock and gravel to small sizes and have an extremely large eccentric and lower shaft bearing; and double countershaft bearings.



OPERATION

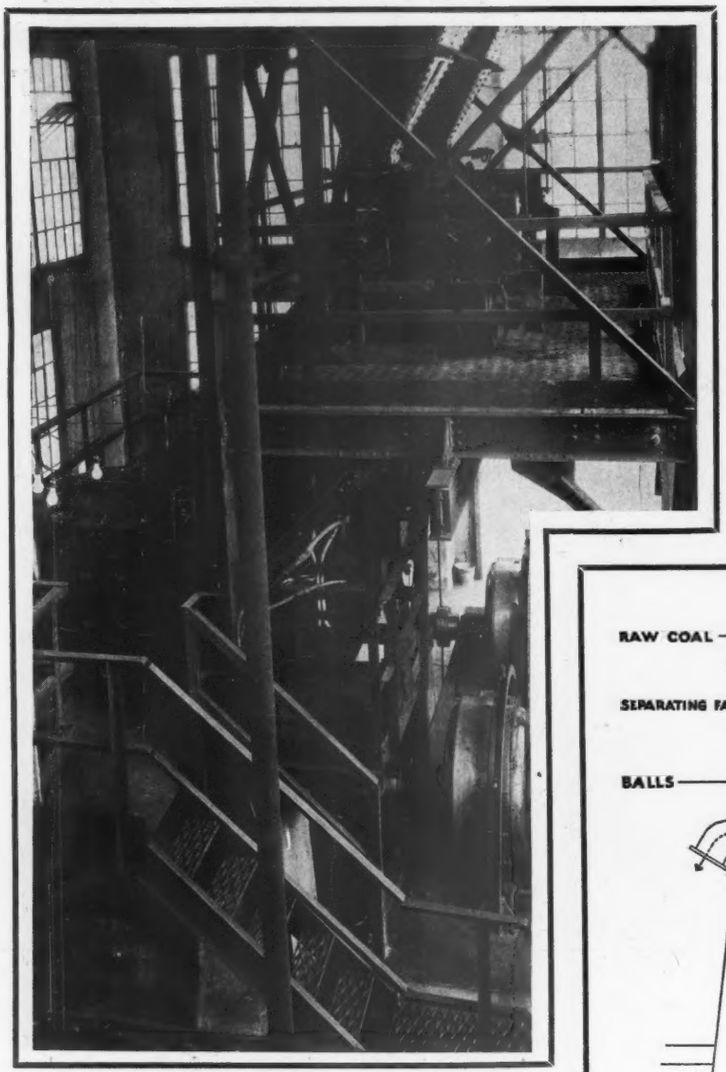
The oil in the reservoir is forced or piled up around the pinion by the rotating of the gear, as shown in the diagrams at the right. The oil is then picked up by the revolving pinion and thrown into the oil pockets, the sides of which are higher than the top of the eccentric and its bearing. Through large holes the oil pours from the pockets over the top of the eccentric and through the shaft and frame bearings. The double countershaft bearings are lubricated with this splash system in the same way.



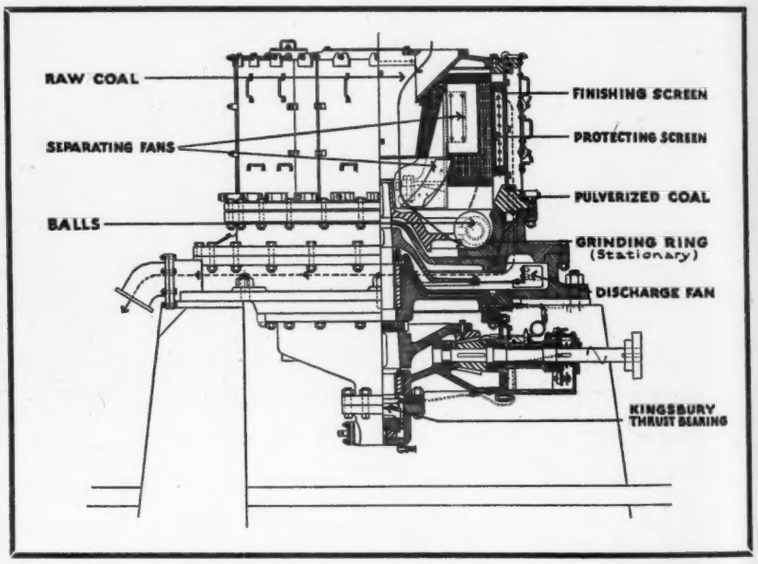
Send for Prices and Catalog

AUSTIN MANUFACTURING CO.
400 N. Michigan Ave. Chicago, Ill.
Established 1858

Lehigh Pulverizing Mills



grind like the mortar and pestle of the chemist



An installation of Lehigh Pulverizing Mills in a large cement plant. To the right, a cut-a-way view of the Lehigh Mill, showing principle of operation

Fine grinding is absolutely essential in order that pulverized coal may be burned properly in a furnace. The degree of useful fineness is not completely determined by a screen test since best combustion efficiency requires a large proportion of very fine coal or impalpable powder.

As a means of obtaining impalpable fines, the chemist's mortar and pestle has never been surpassed. It is the same grinding principle that is responsible for the large amount of impalpable fines obtained with the Lehigh Pulverizing Mill. This type of mill grinds the coal by the centrifugal and gravity pressure exerted by four unattached balls rolling against a stationary, horizontal concave-shaped grinding ring. Wear has no effect upon the uniformly fine and constant pulverization obtained.

Fuller Lehigh Products for the Cement Industry

- Complete Pulverized Coal Equipment
- Pulverizing Mills
- Conveyor System for Pulverized Coal
- Dryers—Rotary and Vertical
- Feeders
- Burners
- Lining Plates for Tube Mills
- Sprockets
- Traction Wheels
- Mill Balls and Parts
- Roll Heads
- Crusher Repairs

FULLER LEHIGH COMPANY

[A Babcock & Wilcox Organization]

FULLERTON----PENNSYLVANIA

When writing advertisers, please mention ROCK PRODUCTS

FASTER...*and Easy on Air!*

In any rock and under all conditions, Hardsocg Drills are unusually fast. For example, in one sandstone quarry the No. 5 machine is drilling thousands of 12-in. holes in one-half minute each. In another instance—an ordinary limestone quarry—18-ft. holes are being drilled in 45 minutes each. These cases are representative of Harsocg performance.

Hardsocg Drills are *faster*—yet at the same time *easy on air!* The No. 5 is scientifically and mechanically right, and the entire mechanism balanced with such absolute precision that the hammer strikes five hard, snappy blows in the same time that many other makes strike but four. On low air pressures, too—from 40 to 60 pounds—the Hardsocg will do a remarkable amount of work.

The rotation is super-strong. There is no "backlash" in the rotating mechanism. An improved design inner bore piston (patent applied for) reduces breakage liability to a minimum.

When you specify Hardsocg Drills you are assured of dependable performance at low cost. Write for descriptive circular.

DRILLS - DRILL STEELS - SHARPENING TOOLS - AIR HOSE
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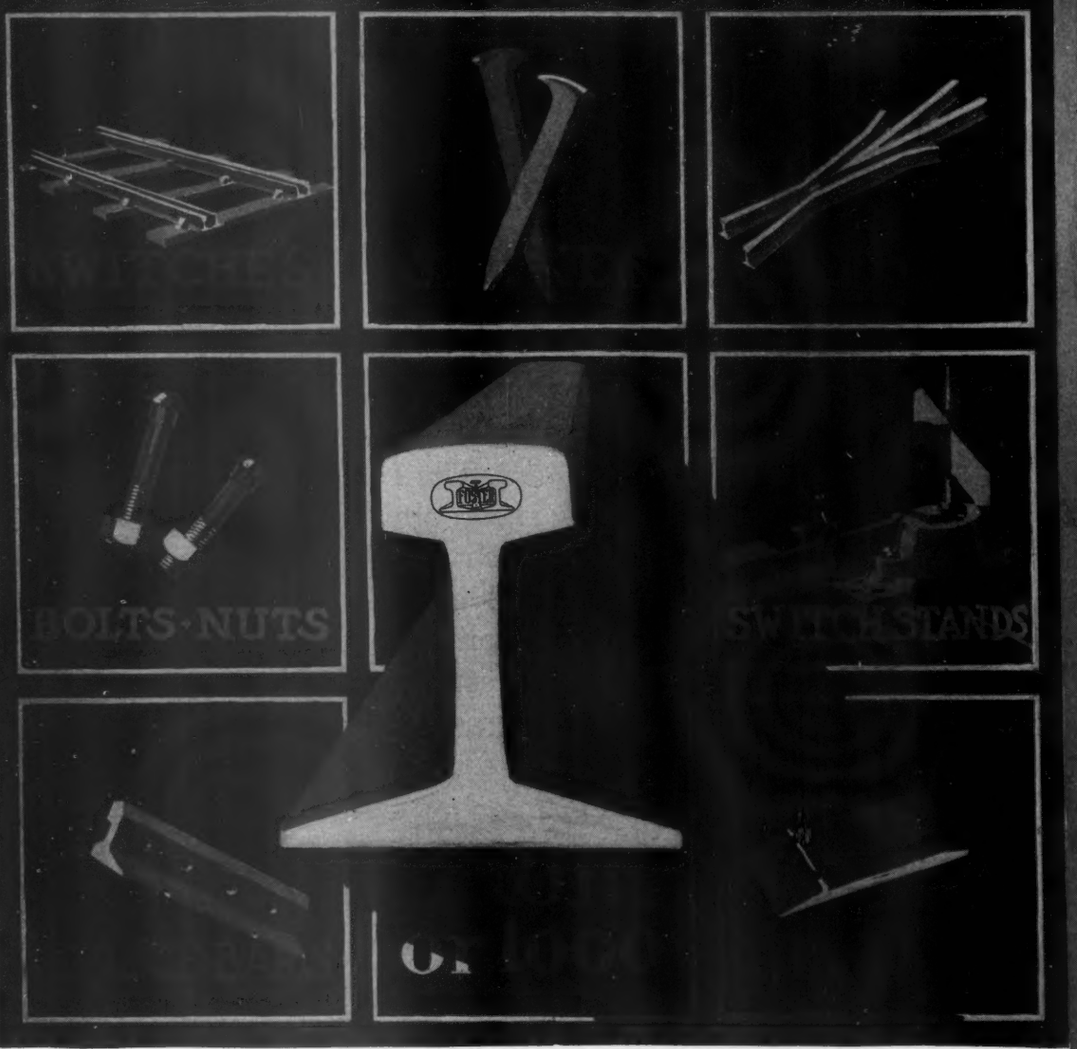

On quick notice, you can have shipped from Foster's nearest plant, 1 RAIL or 1,000 tons of RAILS with necessary ACCESSORIES — Angle Bars, Tie Plates, Frogs, Switches, Braces, Bolts, Nuts, Spikes, etc., — materials for any type and extent of track development . . . inside trackage, sidings, extensions, main line, and for track repairs. Your order will be on its way in 1 to 24 hours after Foster receives it. Every piece of Foster Rail Equipment absolutely guaranteed.

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Hayward Standard Orange Peel Bucket. An all around contractor's bucket, used principally for sewer work, in gravel banks, removing overburden, dredging, excavating and rehandling material generally.

A power wheel bucket of the two line type, one line being used for closing and digging, the other for holding the bucket while it is opening and discharging.

Hayward Class E Clam Shell Bucket, with Ore Bowl. A power wheel bucket of ample closing power for handling loose materials and for certain kinds of excavation.

Used with Guy and Stiff Leg Derricks, Locomotive Cranes, Crawler Cranes, Floating Derricks, Railroad Excavators, and other types of hoisting mechanism.

The Ore Bowl, a tray-like shell, acts like a shovel.

Hayward Multi-Power Orange Peel Bucket. This bucket, fitted with a two part side chain, has double closing power. The power wheel is of sufficient width in the score to accommodate the additional amount of closing line required.

This bucket is used in the very hardest digging jobs, such as work in clay, and compact sand.

Hayward Class K Clam Shell Bucket, which permits three, five and seven part line reeving, and thus can be changed to meet practically every digging and handling requirement from light fast rehandling to hard digging.

Hayward helps to dig *facts*—

Before an engineer buys a bucket and starts to dig, there are facts to be dug. In the crushed stone, rock products, and sand-and-gravel industries as in all others, care in selection will repay the bucket buyer.

The Hayward organization, through Hayward engineers, is always available to help you unearth facts. These engineers have but one aim in discussing buckets with you—to recommend a bucket fitted to its job in every respect. The material to be handled, the type of operating mechanism available, the limitations of the area in which the bucket will be required to work—these are but a few of the factors which must be considered before the correct type can be chosen.

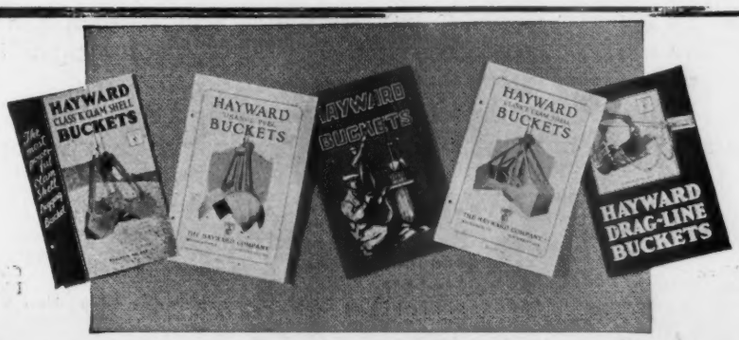
The Hayward line is extensive enough, however, to provide in practically every case a standard bucket which will fully meet the need. Yet for very special requirements, buckets of special types will be supplied.

Every bucket shown on this page is described more fully and illustrated in action in one of the bulletins displayed below, which will be sent you on request.

Ask for them by number as follows:

Orange Peel No. 655.
Electric Motor Bucket No. 45.
Multi-Power Orange Peel No. 655.
Class E Clam Shell No. 650.
Class K Clam Shell No. 653.
Dwarf Orange Peel No. 657.
Industrial Applications No. 623.

THE HAYWARD COMPANY
46-50 Church St., New York, N. Y.



Hayward Buckets

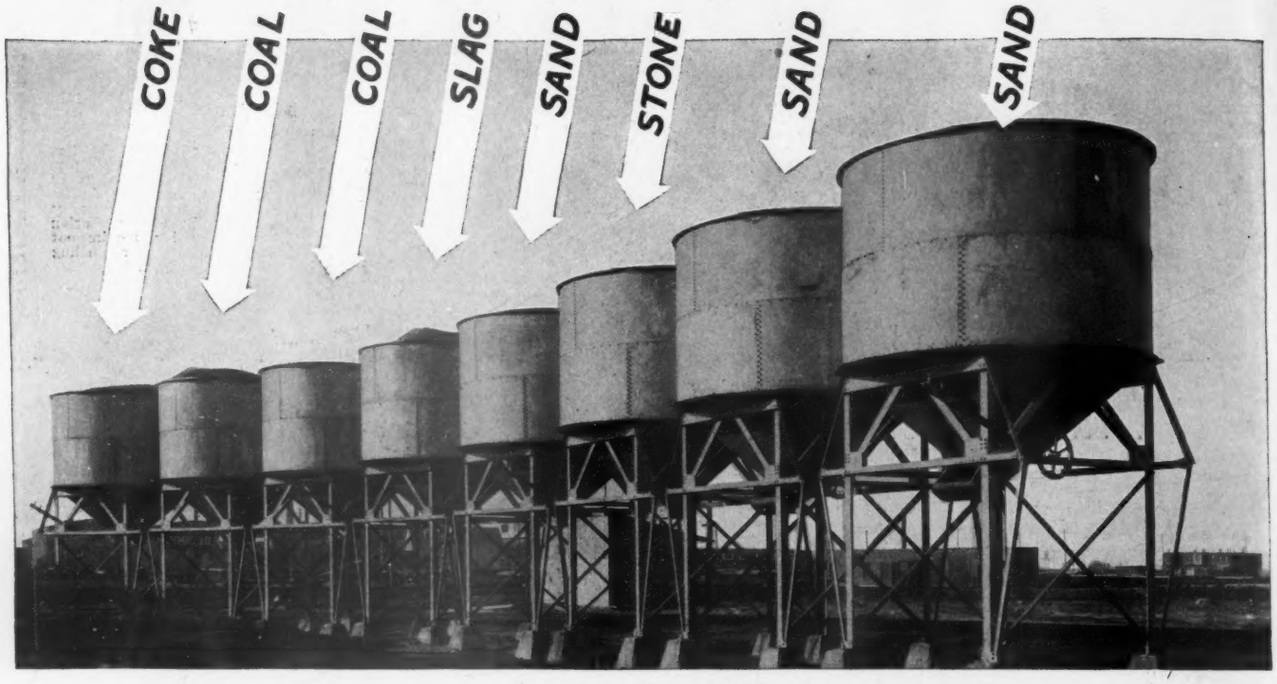
Hayward Dwarf Orange Peel—a midget digger for work in very limited spaces. Can be used inside a pipe of 12-in. and larger diameter. The depth to which it will dig is limited only by the length of the operating lines.

Digs almost any material, hard or soft.

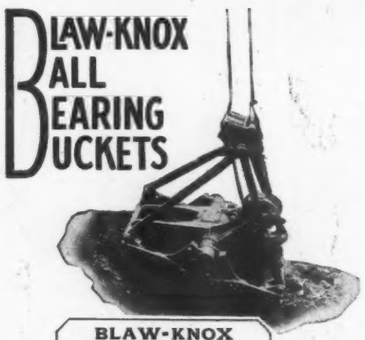
Hayward Electric Motor Clam Shell Bucket. Widely used in foundries and industrial installations generally. Handles foundry sand, coal, coke, ashes, slag, and other bulk materials.

An ever-available bucket. Just hang it on the crane or hoist hook, plug in the cable and the bucket is ready for action.

Steel BINS



Battery of eight 15 ft. diameter Blaw-Knox Circular Steel Bins in the supply yard of the Barber Asphalt Company, Philadelphia, Pa.



BLAW-KNOX PRODUCTS

STEEL BINS (Self-cleaning and Portable)
BATCHERPLANTS
For Central Mixing and Proportioning
MEASURING BATCHERS
For Volume or Weight
INUNDATION SYSTEM
For Constant Concrete
STEEL FORMS for
Roads and Streets
Sidewalks and Curbs
General Construction
BUCKETS (Clamshell and Dragline)
TURNTABLES
STANDARD STEEL BUILDINGS
ELECTROFORGED STEEL GRATING AND FLOORING
AIR PREHEATERS
FORGE AND HAMMERWELDING
STEEL TRANSMISSION AND RADIO TOWERS
TRACYFIER
For Purification of Steam

NO more do storage requirements present the expensive and bothersome problem of designing and building bins.

Blaw-Knox relieves this problem with a complete line of standard STEEL Storage Bins. Easy to operate with minimum maintenance—and infinitely better than any wooden bin that can be built.

Self-cleaning, hopper-bottom construction—equipped with the never failing "no-jam" strike-off gate.

Because of the ease with which Blaw-Knox Bins can be erected (and moved if necessary), they are extremely popular among dealers and producers of sand, gravel, stone, slag, coal, etc.—hundreds are in use.

Write for our Catalog No. 1021 and study the installations we have made. Bins of any size or design, or any capacity, can be furnished.

Remember that Blaw-Knox engineering advice is rendered ***gratis***—complete plant layouts will be made without charge.

BLAW-KNOX COMPANY
Farmers Bank Bldg., Pittsburgh, Pa.

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BLAW-KNOX

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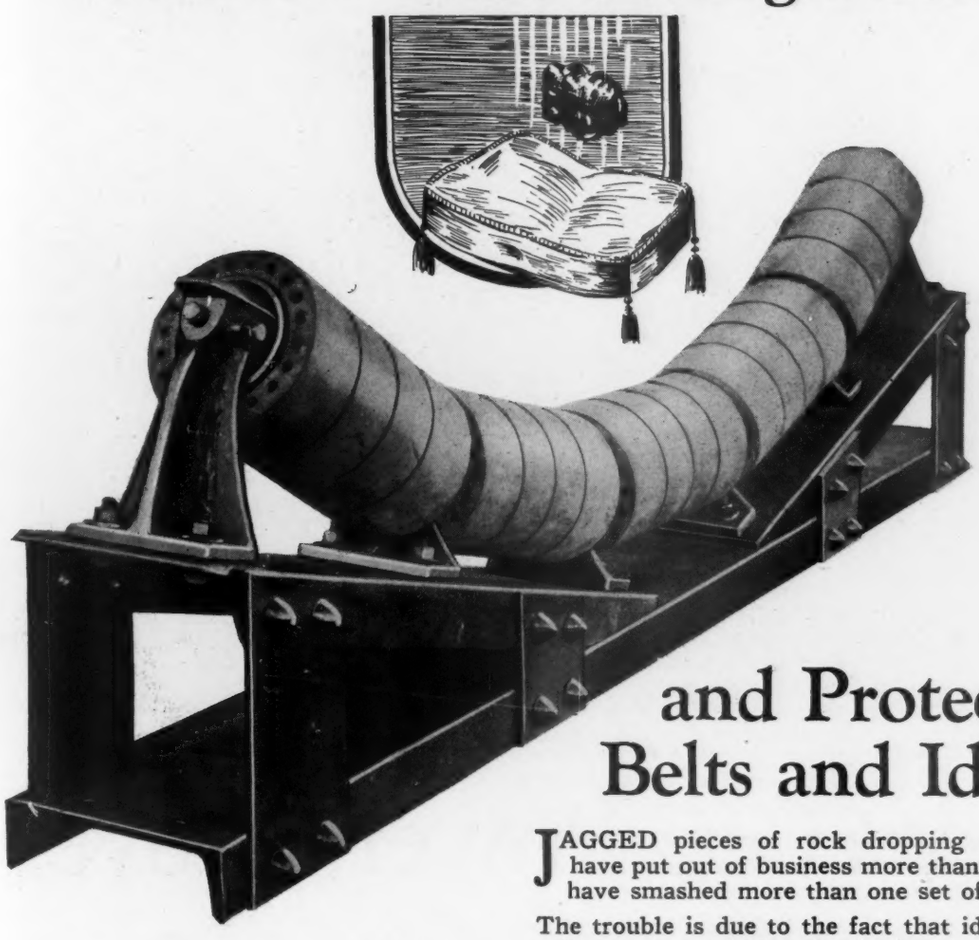
"Cushion" That Falling Rock



and Protect Belts and Idlers

JAGGED pieces of rock dropping onto conveyors have put out of business more than one belt cover; have smashed more than one set of idler brackets.

The trouble is due to the fact that idlers with metal pulleys cannot yield under the blows.

But with the Robins Rubber Covered Idler under the belt at loading points, there is a "give" when the rock hits the conveyor. The belt yields under the blow thus protecting the cover from sharp points. Shocks are largely absorbed before they reach the idler brackets.

Many plants have installed these idlers. They assure belt and idler protection.

Robins Rubber Covered Idlers come in the following standard sizes—36", 42" and 48". Sizes 30", 54" and 60" will be specially priced upon request. Which do you need for your conveyors?

Robins Carrying Idlers

Fifteen different styles of idlers ranging in size from 14" to 60" make up the present line of Robins standard idlers. They have three or five pulleys, plain or anti-friction bearings.

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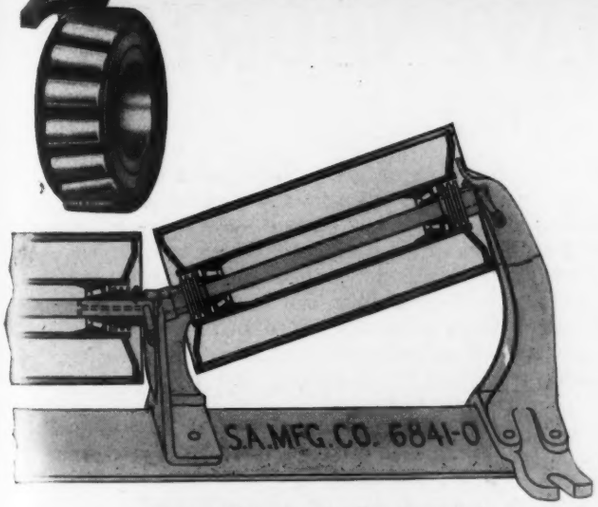

Cross section shows pulley construction and bearing mounting of S-A Simplex Conveyor Carrier. The Simplex is designed for belt conveyors from 18 to 60 inches wide.

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Write for Bulletin No. 16, Which Describes the Features of the Simplex Carrier

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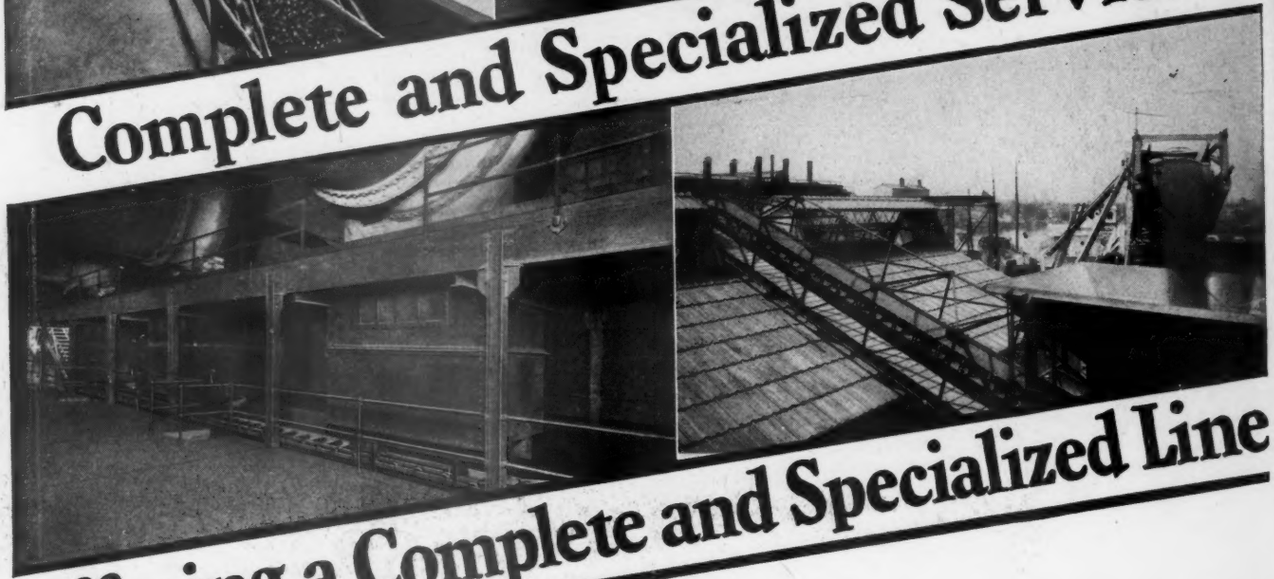

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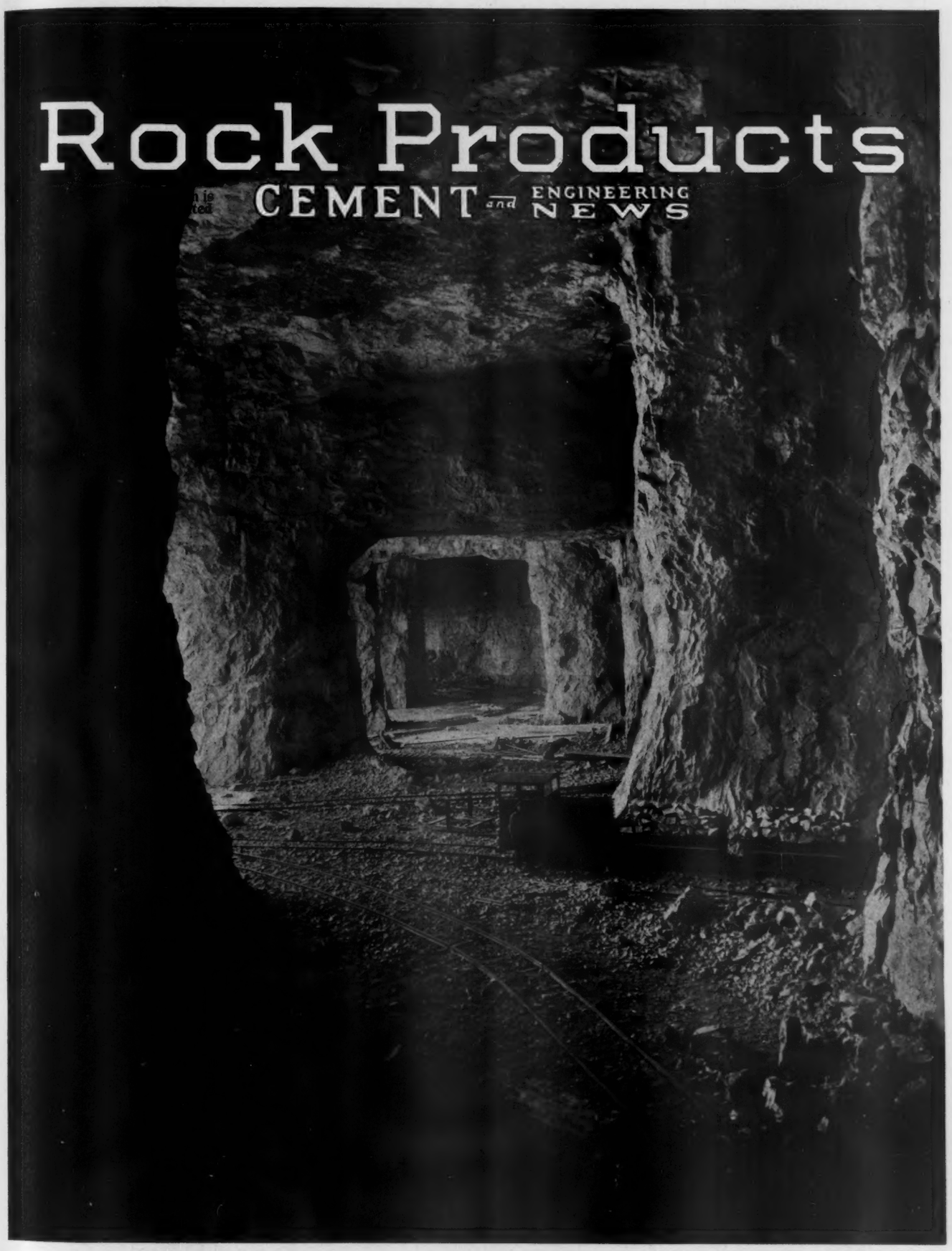
Volume XXXI Chicago, May 12, 1928 Number 10

Rock Products

CEMENT and ENGINEERING NEWS



Limestone mine of the Peerless White Lime Co., Ste. Genevieve, Mo., described in the succeeding pages

Recent Developments in Limestone Mining Operations

At the Plant of the Peerless White Lime Company, Ste. Genevieve, Mo.—Final Stopes Are 75 Feet High

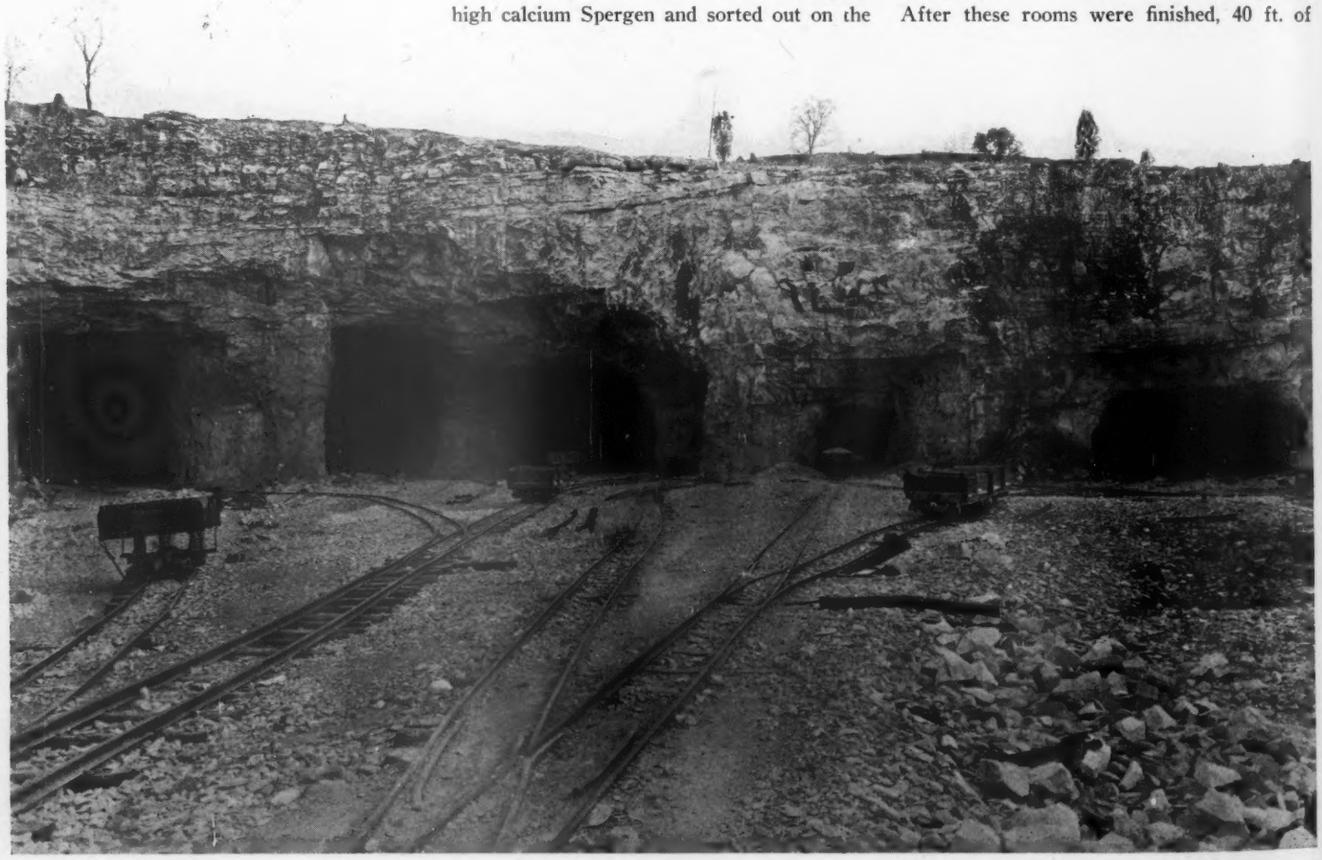
By Ralph W. Smith, E. M.
Mine Superintendent, Peerless White Lime Co., Ste. Genevieve, Mo.

THE PEERLESS WHITE LIME CO. (a subsidiary of the Hunkins-Willis Lime and Cement Co. of St. Louis) has a plant located two miles west of Ste. Genevieve, Mo. It was put in operation in 1908 with two stack kilns located within a few hundred feet of an easily accessible supply of open quarry rock covered with only a thin layer of soil. As the operation expanded, additional kilns were added from time to time and the face of the quarry moved back into the hill more rapidly. By 1920 there were eight kilns in operation and the quarry had advanced into the hill so far that another layer of stone unfit for lime burning had been encountered on top of the good limestone.

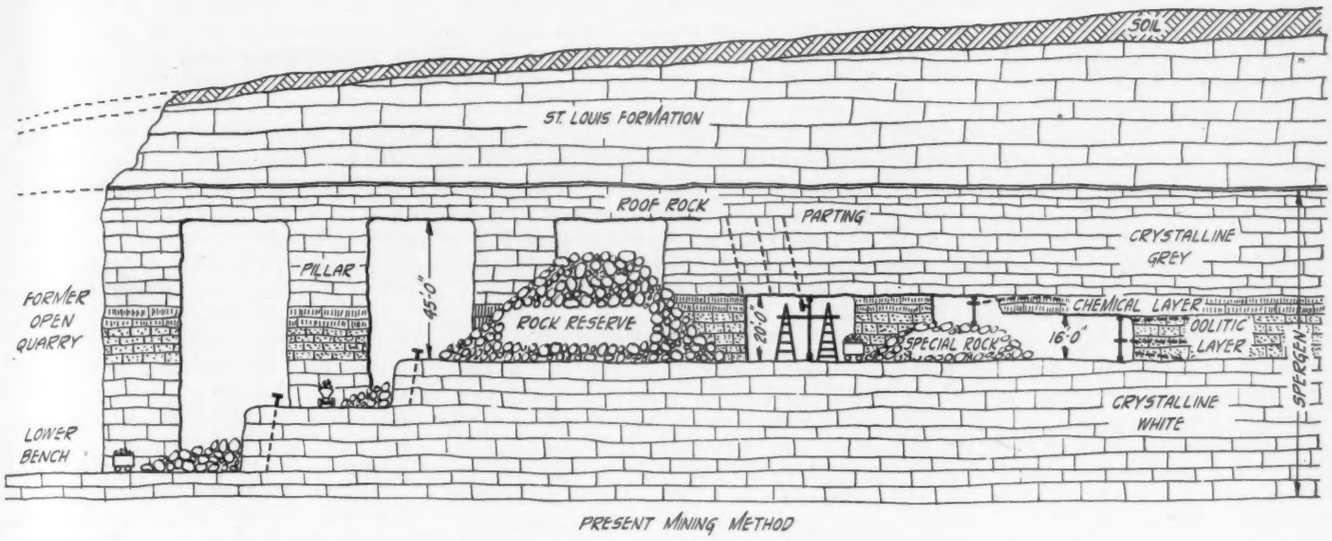
The stone available for burning in Ste. Genevieve county is the upper 70 or 80 ft. of the Spergen formation. It dips approximately 2 deg. 20 min. east (about the same as a 4% grade) and outcrops somewhat parallel to the Mississippi river and two miles west. The Spergen formation is about 160 ft. thick here, but the lower portion is not pure enough for the high-calcium chemical lime in which the Peerless White Lime Co. specializes. Above the Spergen formation and conformable with it is the St. Louis limestone, a cherty and impure member of the Mississippi group, of no interest in lime burning.

As the Peerless quarry advanced up the hill it met the St. Louis formation near the top, thin at first, but becoming thicker with each foot of advance. At first the St. Louis rock was shot down with the underlying high calcium Spergen and sorted out on the quarry floor. This soon became prohibitive, however, when the formation attained a thickness of 30 ft., and from this condition arose the necessity of mining operations, which were started in 1921 and have become quite extensive since that time. Although the cost of extraction is slightly higher than from an open quarry, this is offset by certain advantages: A clean grade of stone, entirely free from adhering mud and clay and especially suitable for making chemical lime of high purity, is supplied to the kilns; clean spalls are available for various limestone products; mining operations are not affected by weather conditions.

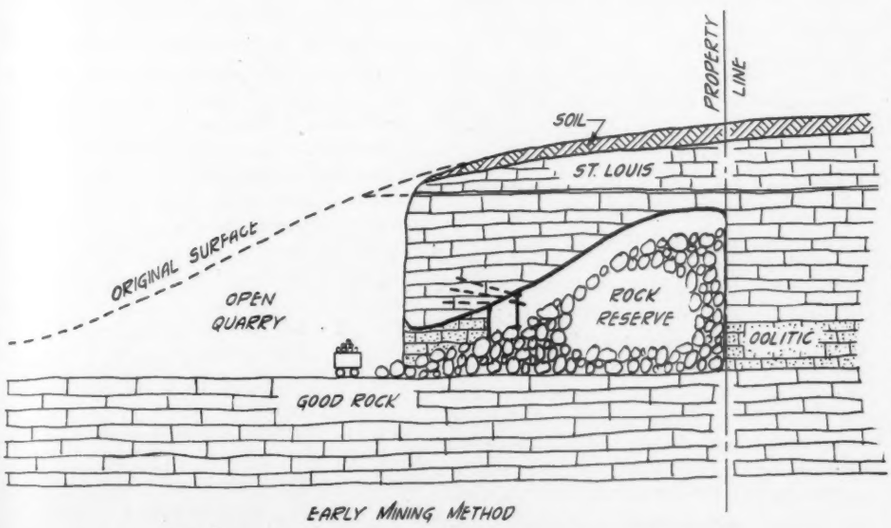
In opening up the mine, parallel rooms 35 ft. wide by 8 ft. high were driven from the level of the old quarry floor to the property line (only several hundred feet at this point). After these rooms were finished, 40 ft. of



Entrances to limestone mine of the Peerless White Lime Co., Ste. Genevieve, Mo.



Limestone mining method recently developed at Ste. Genevieve mine

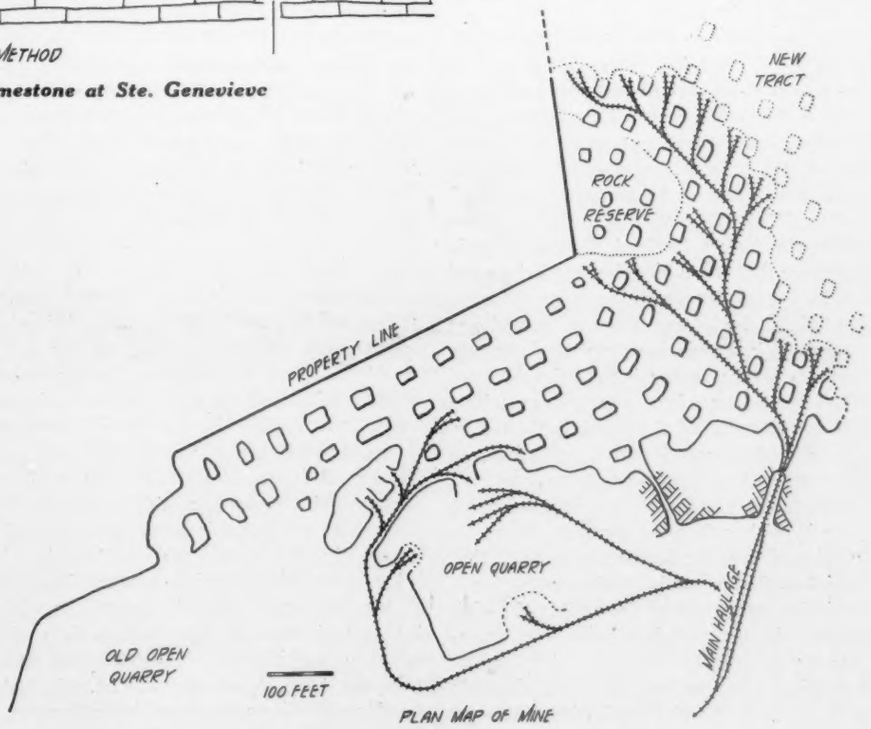


Older method of mining limestone at Ste. Genevieve

the roof rock was removed from the back by a semi-shrinkage system of "flat-holing" from the muck pile. In order to take care of the increase in the volume of blown stone in these rooms, a part of the rock was loaded away continuously during the mining operations.

In this early mining, long supporting ribs about 15 ft. thick were left between rooms. Fig. 1 illustrates this method and also shows how it was possible to have a large tonnage of broken rock on hand, but a large portion of it unavailable because of the small number of loading tracks per thousand tons of rock. An immense stope full of blown rock could only be attacked on two loading tracks. To offset this, during the early mining, when they were changing over from open quarry, there were yet a considerable number of loading tracks in the open quarry. Thus the burden of production did not fall upon the underground openings and a few underground tracks were sufficient.

There were other unsatisfactory features of this first mining procedure. It is a curious anomaly that the product from a limestone mine or quarry is practically 100% "ore," yet approximately 20% of this is rejected *because of its size* (unless special and costly equipment such as rotary kilns are installed to utilize this waste). As a general rule nothing under 4-in. rock is put in stack kilns, and thus any increase in percentage of small rock is an increase of waste product. Mining operations in general have a tendency to increase the spall percentage over that from open quarry operation, because most shooting is "tighter, i.e., there are not the free faces to break to that there are in an open quarry. Thus it was found at the Peerless mine that blasting the stone down



Plan of Ste. Genevieve limestone mine showing extensive trackage system

from the back by means of "flat-holes" drilled somewhat parallel to the bedding planes of the stone increased the spall percentage considerably.

This semi-shrinkage system of removing part of the rock continuously from the foot of the pile also gave a cumulative result which was not satisfactory. The large rocks from the shots rolled to the foot of the pile, and were broken up and loaded out. The spalls from these large rocks were left, and new rock was shot down on top of them. Thus a stope produced an abnormally high percentage of rock while it was being filled; but after the mining was finished, the loaders encountered a high percentage of spalls in cleaning out.

It has also been found that it was unnecessary to leave so much rock in the ribs, which only gave a 65% or 70% extraction. During the past two years 40-ft. holes have been cut through these ribs in the old workings, thereby increasing the extraction to almost equal the average of 86% attained in the later workings.

A year or so after starting underground the open quarry was temporarily discontinued and the entire production was demanded from the mine.

As yet the rock supply was not remote from the kilns, grades were short, and mule haulage was economical and otherwise satisfactory. Track maintenance was not excessive with mule haulage. In 1924, however, work had progressed so far in the mine that it was difficult and dangerous to continue mule haulage. The headings were 1100 ft. from the kilns and 400 ft. of this was 4% down grade. For this reason, Whitcomb gasoline locomotives were installed, one locomotive being held in reserve for emergencies.

Changes in Mining Methods

During the last few years mining methods have been developed which enable the mine to meet the requirements of the kilns and the peculiarities of the limestone beds to better advantage. The thickness of the available rock is so great as to suggest "shrinkage" stopes. With this method tunnels are driven below the lowest level of the usable rock, and from these tunnels, raises are driven and stopes opened out from the raises. Chutes are built at the bottom of the raises and just enough broken stone is drawn out from time to time to take up the increased volume of blasted rock and keep the miners within working distance of the back. Such a plan, widely used in metal mines, necessitates a substantial "development" cost, however, and is not adaptable to limestone unless the usable stone is thicker than the Spergen formation. In spite of this, the Spergen is so thick that special methods must be used to extract economically and safely all the rock in the high stopes. At the Peerless mine the procedure is:

Original headings are driven 40 ft. wide by 16 ft. high, which completely removes a layer of high-grade, oolitic limestone. This stone is loaded and usually burned separately from the other stone in the mine and yields high-grade chemical lime. The ground is drilled with tappet drills mounted on 16-ft. columns. As many as 15 holes (about 300 tons) are drilled from one set-up, but the average is about nine holes. Holes range from 15 ft. to 20 ft. in depth and are drilled horizontally in rows of three—a top, middle and bottom hole. A special firing order and program of loading is used, which has helped to reduce the percentage of spalls.

Special Safety Precaution

Drilling, loading and shooting are all coordinated, for these operations must proceed simultaneously in all headings. If the work is not planned properly, one heading may be full of broken rock, with no holes and no place to set up a drill, and another heading may have no broken stone and no holes. An interesting safety feature in the mine with regard to blasting is the use of red flare powder which is burned at points of blasting just previous to the shot, as a warning to the miners. Another safety measure of considerable value both to the miners and the locomotive crews is the installation of electric lights along the main haulage ways and 500-watt flood lamps in working places.

In some portions of the mine, immediately overlying the oolitic limestone, is a layer of stone from 2 ft. to 4 ft. thick, which has chemical possibilities making it particularly well adapted for certain purposes. This is taken down with a stoper or mounted machine to a parting which furnishes a cheap, safe roof. It is cheap because if properly drilled and shot it requires no further labor for trimming or scaling. This stone is shot down on the tracks which were laid for removing the rock in the original headings, and is then loaded out and burned in a special kiln for this purpose. It is entirely removed from the room before any more rock is mined, and in this manner it is kept separate from the average run of stone. Sometimes this layer is "flat-holed" and other times drilled with vertical holes, according to the condition of the parting.

Bringing Down 750 Tons in One Shot

The removal of this layer leaves an empty gallery 40 ft. wide by 20 ft. high. There is an excellent parting 25 ft. above this roof or 45 ft. above the heading floor, and the mining of this block helps reduce mining costs. It is brought down by vertical stoping with a dry drill mounted on an 18-ft. column drilling 21-ft. to 24-ft. holes. By drilling vertical holes across the bedding planes, the percentage of spalls is materially reduced. Nominally, five such holes is a round and brings down a block which measures 25x40x9 ft., or 750 tons. This fills the gallery with broken rock to within 8 or 10 ft. of the roof, which makes it very handy to inspect and trim the roof if necessary. The principal trouble with this roof is caused by mud cracks. There is only 30 to 40 ft. of overlying rock, and the roof, although solid, is occasionally cut by large mud cracks. The larger pockets are given a "dental filling" by means of expansion bolts in the roof, two pieces of old rail and a few planks. This prevents mud and gravel from falling during rainy seasons.

The large pile of rock in these galleries is also shot down on the original tracks, which are thereby used three times in one position. The tracks are carefully covered with rock before blasting, but the mining system is such that very little rock has to be handled for this purpose, because the rock is shot on to the pile and allowed to roll down on the track instead of dropping directly on it. This pile is the main rock reserve and is maintained fairly large, normally about two months' supply.

Final Stopes Are 75 Ft. High

The sides of the pillars are carefully trimmed as the large pile is loaded out, for work is yet to be done in these stopes. There is 30 ft. of rock to be removed from the floor, which is done by benching with jackhammers. When completed it leaves a stope about 75 ft. high. One of these stopes which has 20 ft. yet to be benched out is shown in the picture. With the present spacing of pillars, 86% of the rock is removed. As yet no attempt has been made to rob any pillars, because no part of the mine is ready. It has not been determined whether it will be advisable to do this later. Gardner-Denver rock drills of the "Dreadnaught" type are being used at present.

Recent developments included the driving of two new entries which provide a new and short outlet of the rock in the headings to two larger production kilns which went in operation in 1926. These tunnels also tap the center of a new tract of land. Daily production in the mine is sufficient to supply nine large kilns together with a considerable quantity of rock sold for commercial purposes. Hydraulic stripping is now in progress on the lower portion of the new tract of ground, and several years' supply of rock is clean. The open quarry is now supplementing the mine production, thereby giving a well-balanced condition with regard to costs and a flexible unit with regard to operation.

Mississippi Plans Concrete Road Campaign

GOVERNOR BILBO of Mississippi has strongly recommended paving the arterial highways of the state with hard surfaces and the *Hattiesburg* (Miss.) *American* backs up the governor and says:

"The fact that such a program would cost more than $50,000,000 seems to scare some folks out of a year's growth. Mississippi has wasted this amount and more within the last ten years on gravel roads which wore out before the bonds fell due. Other states have issued bonds and paid for concrete roads with gasoline taxes. Mississippi can surely do likewise."

Modern Rock Products' Water Pumping Plants

Applying Engineering Knowledge and Experience to Problems of Quarry Dewatering, Boiler-Water Supply and Stone or Gravel Washing

By D. W. Yambert
Mechanical and Electrical Engineeer, France Stone Co., Toledo, Ohio

DURING RECENT YEARS the stone quarrying industry has advanced tremendously in the more scientific application of machinery and methods, and although today the engineering tendency is toward the very highest type of pumping machinery, this particular phase of quarry operations seems to have been neglected longer than the rest.

Evidently it is not generally realized that the installation of modern pumping equipment will usually prove to be an exceptionally high yield investment, for many quarries are still equipped with very obsolete and inefficient pumping units. It is therefore hoped that this article may influence quarry operators to investigate the possibilities of more modern pump installations.

The most common quarry pumping problems come in the following three classes which will be discussed separately: (1) Quarry dewatering; (2) Boiler supply and boiler wash-out; (3) Stone washing.

Quarry Dewatering

The most highly developed and efficient pumping unit for quarry dewatering is the single-stage, double-suction, horizontal, centrifugal pump, with bronze shaft sleeves, double wearing rings, bronze closed impeller, and horizontally split case (see Figs. 1 and 2).

The pump should preferably be direct-connected through a flexible coupling to a high-speed electric motor. If electric power is not available these pumps can of course be furnished to be driven by other types of power units.

There are many manufacturers building this type of pump and a number of them can assure reliable operation and guarantee high efficiency.

Efficiencies of from 75 to 86% are not uncommon. This is in comparison and contrast to 30 to 50% which is about all that can be expected from old design, single-suction, horizontal, belt-driven, open-impeller, centrifugal pumps.

The modern pumps are made with double suction, that is, arranged so that water enters both sides of the impeller, thus keeping the forces on the impeller practically balanced, and minimizing the tendency for end thrust on the pump shaft. This reduces wear and friction and therefore the brake horsepower requirement.

For pumping clear, cold water these pumps are usually equipped with bronze impellers of very scientific design. The curved surfaces of the vanes of the impeller are calculated (or designed) so as to impart the greatest centrifugal force to the water with the least loss of force due to friction. These impellers are cast to general shape and are then carefully dressed to exact curvature and finished by hand filing. The fact that small centrifugal pumps are not as efficient as larger ones is largely due to the inability to dress the very small impellers to the accuracy that is possible on the larger ones.

Adjustment and Operation

A water-sealed packing gland is provided along the pump shaft on each side of the impeller to prevent the pump from taking in air along the shaft. These glands should be kept just loose enough, and the cocks to the water seals should be kept just sufficiently open, to allow a light dripping of water. This will insure against the pump taking air along the shaft and will also prevent the packing from heating and scoring the shaft sleeves.

The portion of the pump shaft which runs in the packing glands is provided with bronze wearing sleeves. If scoring or excessive wear occurs, these sleeves can be replaced with new ones, thus avoiding the necessity of replacing the entire pump shaft.

In contrast to the above the old type, horizontal, belt-driven centrifugal pumps usually have a rough, cast-iron, single-suction, open-type impeller, and the shaft is not provided with sleeves in the packing gland. They are very inefficient and there is a great tendency for the impeller to crowd endwise, increasing the friction and wear. The friction of the packing in this type of pump causes wear directly on the shaft, which when badly worn must be entirely replaced.

The flexible coupling for connecting the pump and motor is of importance, for it is very often found after completion of the pump installation that the great weight of the pump piping has caused a strain in the pump base which is sufficient to cause a slight misalignment of the pump and motor shafts. The flexible coupling will care for a slight misalignment; however, it will sometimes be found necessary to correct the alignment by placing shims under the feet of the pump or motor, as the case requires.

Such misalignment can be fairly well guarded against during the installation by providing blocks of concrete or other substantial material at the proper points to support the weight of the piping and to prevent the strain from being transmitted to the pump frame.

Old vs. New Pumps

Even direct-motor-driven, double-suction centrifugal pumps may be found very inefficient if they are 10 to 15 years old. This is partly due to the fact that after long use the impeller and case become worn and pitted, and partly because of the remarkable increase in efficiency obtainable from pumps of very recent design.

If the pumps are old it will most likely be found upon investigation that it would be a paying proposition to discard these old pumps and install brand new ones. An actual example of this sort is given below:

A quarry was equipped with two 11-year-old pumps: A No. 8 double-suction pump, 2300-g.p.m. capacity, 73% efficiency (with brand new impeller), direct-connected to 50-hp. motor; and a No. 10 double-suction pump, 2500-g.p.m. capacity, 70% efficiency (with brand new impeller), direct-connected to 75-hp. motor.

These two pumps were replaced by two new No. 8 double-suction pumps, 2200-g.p.m. capacity, 83.5% efficiency, direct-connected to 50-hp. motors, at a total cost (pumps, motors and bases) of $1,886.06.

The reduction in the power bill due to this change, based upon pumping the same quantity of water, was $37 per month. In other words, the new installation, disregarding salvage value of the old equipment, was paid off in power savings in four years and three months.

How to Determine Pump Specifications

When contemplating a new pump installation it is important that a careful determination be made of what the total pumping head is to be. This total head consists primarily of the static head or vertical lift, and the friction head or losses due to friction in the pipe and pipe fittings.

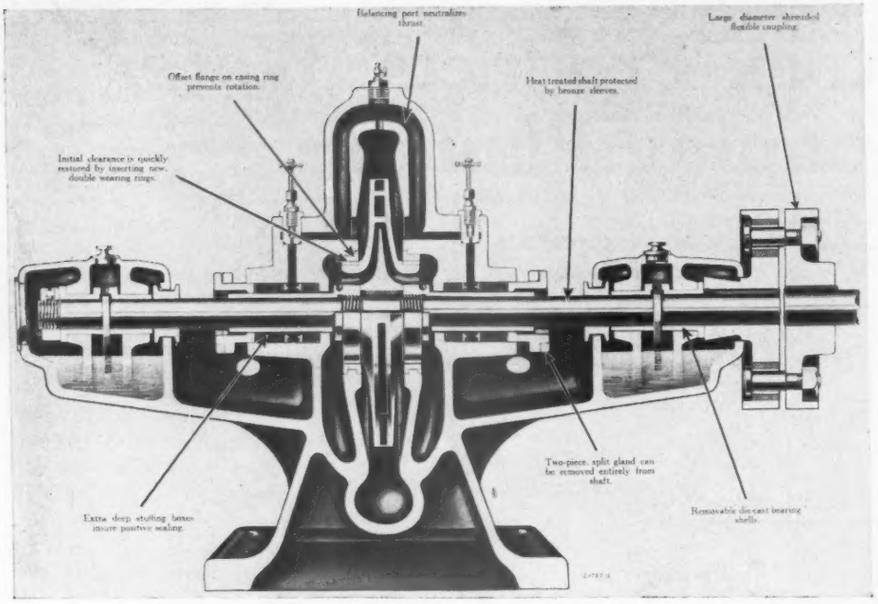

Balancing port neutralizes thrust.
Large diameter shrouded flexible coupling.
Offset flange on casing ring prevents rotation.
Heat treated shaft protected by bronze sleeves.
Initial clearance is quickly restored by inserting new, double wearing rings.
Two-piece, split gland can be removed entirely from shaft.
Extra deep stuffing boxes insure positive sealing.
Removable die-cast bearing shells.

Fig. 1. Modern single-stage, double-suction horizontal centrifugal pump, with bronze shaft sleeves, double wearing rings, bronze closed impeller and horizontally-split casing

To accurately determine the static head, a set of levels should be taken from the pump section to the discharge point.

The amount of friction head depends upon the size of pipe, the number of bends, the sharpness of the bends, and the quantity of water to be handled per minute.

Tables can be had which indicate the probable friction loss in both short-turn elbows and long-sweep elbows for various quantities of water flow per minute. Similar tables can also be obtained giving the friction loss in terms of feet-head for various sizes of pipe and for various quantities of water. It is much more convenient and satisfactory, however, to determine these friction values from a chart of pipe friction curves plotted from calculations by Hazen and Williams' formula (with C equalling 100) (see Fig. 3).

The friction loss of several sizes of pipe should be determined for every pump installation in order that the most economical size may be chosen, considering pipe cost as against reduced pumping power cost. A little additional expenditure for larger pipe may pay large returns in the way of reduced power cost.

In many cases, pipe installations, even where the discharge piping is quite long, are made of a size to correspond with the size of the pump discharge flange, no consideration being given to the amount of friction loss. In some few cases the pipe is made even smaller than the pump discharge flange.

Computing Pumping Head for Wash-Water Pump

An example of an actual determination of pumping head for a washing pump follows:

Fig. 4 illustrates a plot of the levels that were taken over the course to be followed by the pipe line. This curve gives the static pumping head and also the length of pipe required.

The requirements were 1000 gal. per min. (g.p.m.) with 10 lb. pressure at end of the line.

Static head	85.69 ft.
Friction head for 386 ft. of 8-in. pipe at 1000 g.p.m. (3 ft. per 100 ft.)	11.58 ft.
Friction of elbows	4.50 ft.
Velocity and entrance head	1.40 ft.
Friction of foot valve	1.00 ft.
10 lb. pressure at end of line, equivalent to	23.10 ft.
Total pumping head	127.27 ft.

The pump was therefore ordered for a total pumping head of 128 ft.

If it is desired to check the friction loss being sustained in pump piping already installed, and the pump capacity is not known, a rough determination of the capacity can be made, if the pipe discharges horizontally, by measuring the distance the water is thrown.

Referring to the sketch (Fig. 5), the velocity in feet per second equals:

$$x \text{ (in inches)} \frac{16.1}{y \text{ (in inches)}}$$

With the velocity thus roughly determined and the pipe size shown, the capacity in gallons per minute can be easily calculated. The friction loss for this particular capacity and pipe size can be determined by referring to the pipe friction chart.

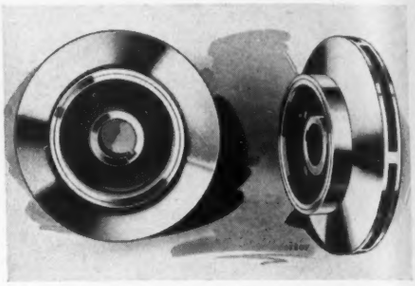


Fig. 2. Bronze closed impeller—note renewable wearing ring

Pipe Fittings Important

Pipe fittings are also important. All elbows should be long-sweep, all reducers should have a gradual taper rather than an abrupt offset, and all pipe bends should be made as gradual as possible. All of these

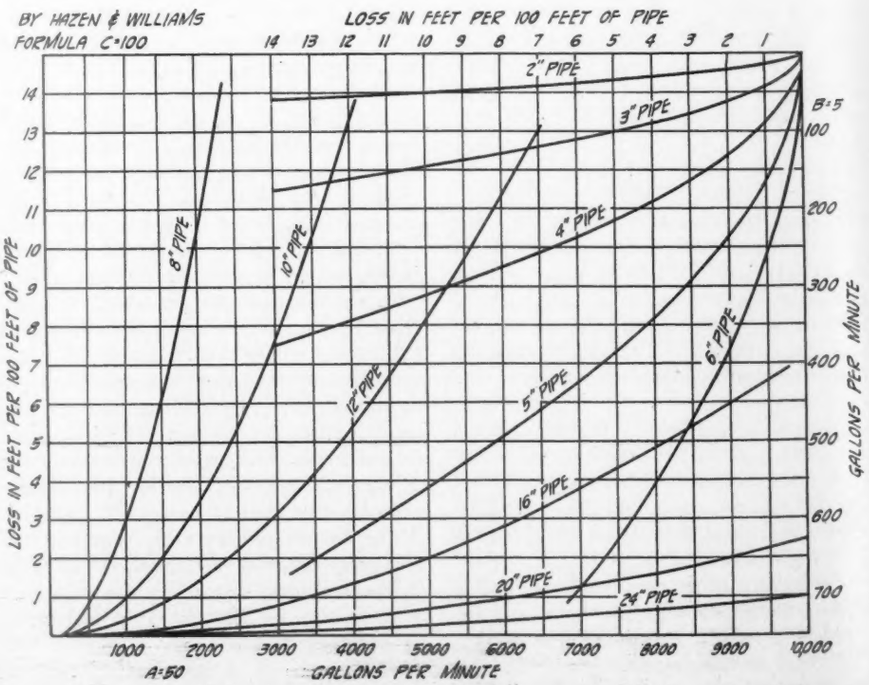


Fig. 3. Curves plotted from Hazen and Williams formula for determining friction losses in pipes of various sizes

will help to reduce friction losses. Figs. 6 and 7 illustrate a carefully planned pump and piping installation. Fig. 8 illustrates a smooth bend made in 12-in. pipe.

It is standard practice to equip the bottom of the suction pipe with a foot valve. For quarry use, however, a brass seat swing check valve will be found more satisfactory. A foot valve will not seat properly unless

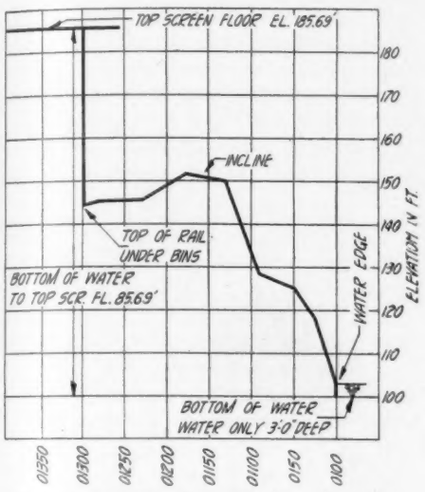


Fig. 4. Profile of a pipe-line installation for wash water

mounted in an almost vertical position, which of course is not always possible in quarries. It is also quite common for foot valves to be prevented from seating by some small pebble or other obstruction becoming lodged on the seat. These difficulties are not usually experienced with swing-check valves.

These swing-check valves may be installed at the bottom of the suction pipe, or may be installed just above the water level. Because of the greater ease of inspection and repair, the latter location is preferable, provided, however, that there is a greater length of suction pipe between the check valve and the pump than between the check valve and the bottom of the suction pipe, and also provided that the suction pipe below the check valve is absolutely water- and air-tight.

The average strainer installed at the bottom of suction pipes is of relatively small dimensions and becomes clogged rather quickly with sticks, moss, etc. A strainer made of perforated metal and of large dimensions will be found a great deal more satisfactory (see Fig. 9).

Selection of the Motor

The motor for driving a centrifugal pump should be properly chosen. Because of the low starting torque required by a centrifugal pump, the squirrel cage motor is very suitable for centrifugal pump drives. The standard squirrel-cage motor, however, requires a starting compensator which is rather complicated and is a source of more or less electrical trouble.

There has recently been developed a line of motors called the double, squirrel-cage type, which can be started under full voltage, and therefore requires nothing but an across-the-line type starter.

The double, squirrel-cage motor draws a slightly higher starting current than the standard squirrel-cage motor does on the 80% compensator tap. Its current curve, however, gradually slopes downward as the motor comes up to speed.

The standard, squirrel-cage motor started with a compensator causes two current surges instead of one. While the first surge is less than that caused by the double, squirrel-cage motor, the second surge which occurs at the compensator change-over point will, if change-over is made at less than 70% synchronous speed, considerably exceed the starting surge of the double, suirrel-cage motor. This is graphically illustrated by the "Speed-Current Curves," Fig. 10.

The double, squirrel-cage motor is to be preferred for centrifugal pump drive because of the following advantages: Its starting equipment may be much simpler. It causes only one current surge during starting. Its starting current surge is probably less than the compensator change-over surge of a standard, squirrel-cage motor.

A number of double, squirrel-cage motors of horsepower rating up to and including 75-hp. are now being used successfully on centrifugal pump drives (see Fig. 6).

Picking Pumping Station Site

It is very important when choosing the location of a quarry dewatering pump installation to pick that location which has the shortest vertical distance (or static pumping head) from the pump basin to the discharge point; and that which will require the shortest run of pipe. An actual example of an improperly chosen pump location follows:

A large quarry had its pump installation located about ¼ mile from a creek which flowed along one side of the quarry. The water was discharged at an elevation considerably above the creek level and ran overland and downgrade into the creek.

The pumps were re-installed along the

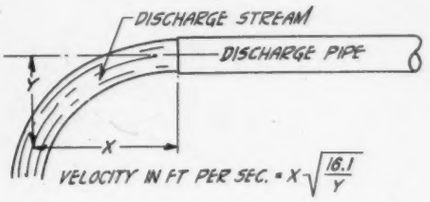


Fig. 5. Formula for computing velocity from discharge of horizontal pipe

side of the quarry adjacent to the creek. This resulted in reducing the total pumping head one-fourth and showed a saving on the power bill of $78.33 per month.

The discharge end of dewatering pump-pipe lines should be bent down as low as possible to help reduce the pumping head.

It is sometimes necessary to discharge the water over a bank of dirt, and oftentimes where this is the case the discharge pipe is carried just over the peak of the dirt bank and the water is permitted to spout out into the air. In a case of this sort the pipe should either be bent down to the bottom of

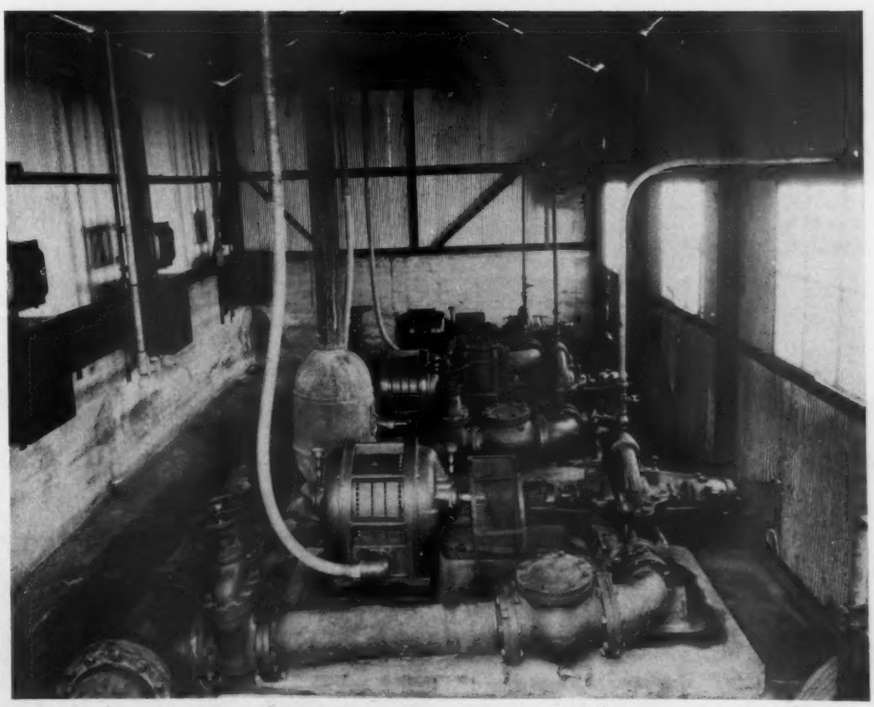


Fig. 6. A carefully planned pump and piping installation. Note the taper reducing elbows; float switch in the rear right-hand corner. Front to rear: 1000-g.p.m. wash-water pump driven by a 75-hp. double squirrel-cage motor; 1000-g.p.m. wash-water pump, like the first; 2200-g.p.m. dewatering pump driven by 50-hp. squirrel-cage motor

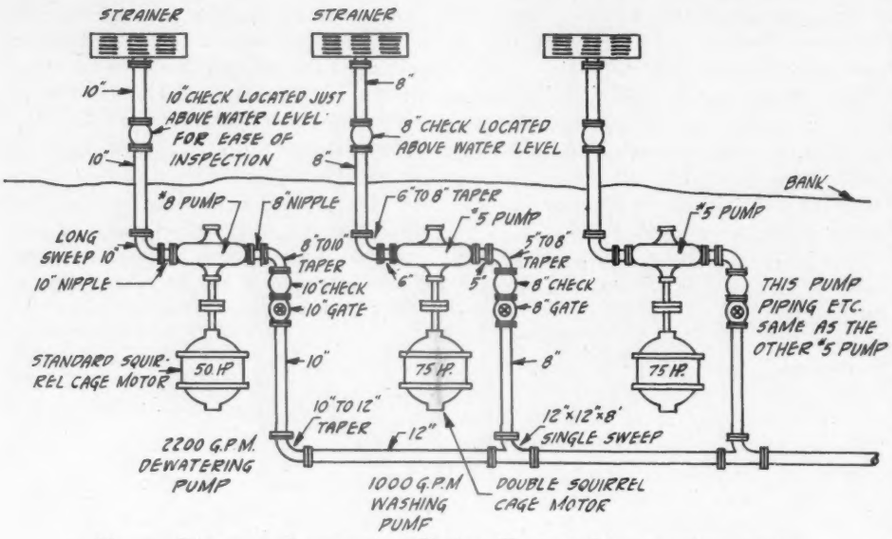


Fig. 7. Diagram of pump installation illustrated on previous page

the bank, or a trench should be dug through on the level of the bank bottom. The result will be the same in each case except that there will be a slight amount of additional pipe friction where the pipe goes up over the bank.

If we assume a problem where the total

Fig. 8. Example of a gradual bend in a 12-in. pipe main

pumping head when discharging over the top of a 15-ft. bank of dirt is 60 ft., the head could be reduced to about 45 ft. by bending the pipe down on the other side of the bank, and the pumping cost would be reduced by about one-fourth.

Wherever the discharge end of a pipe line is lower than other parts of the line, a syphon action is present which neutralizes or cancels any additional power that the pump motor would otherwise be called upon to deliver in order to force the water to the highest point in the line.

Saving by Syphon on Discharge

An actual example of what can be accomplished by making use of syphon action follows: A quarry located along the bank of a river had a pump installation which merely forced the water over the edge of the bank, which required 25 hp. A new pump was installed with pipe running up over the bank and on down into the river. The new pump with the syphon action only required 10 hp. to handle the same amount of water as previously handled.

The original total pumping head was 56 ft., and the total pumping head for the new installation, allowing for syphonic action and pipe friction, was only 25 ft.

Economy in Operation of Pumping Plant

It is a mistake to keep the water in a quarry pumped down any lower than is absolutely necessary in order that the shovel may not have to dig in wet stone. If the quarry is pumped lower than this the pumping power cost will increase.

There are two reasons for this increase in power cost. First, the pumping head will be greater, requiring more power. Second, lowering of the water reduces back pressure against the incoming water springs, thus increasing to a certain degree the amount of water entering the quarry.

In almost every case of quarry dewatering an automatic stop and start control should be used. This type of control usually consists of a magnetic starting switch operated by a float switch. The float switch should be mounted in the pump house, where it is accessible, and the operating chain run

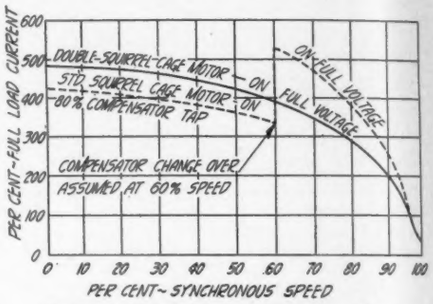


Fig. 10. Speed-current curves for electric motors

through suitable pulleys to a rack in the pump basin where the float ball is located (see Fig. 11).

In winter the rack and float ball should be located near the suction intake where the surface will not freeze, provided the pump operates frequently enough.

If the pump basin is quite large in area, the average float switch, on account of its not having fine adjustment, will in zero weather probably not start the pump soon enough after shutdown to prevent freezing of the pump lines, and the surface of the water in the pump basin where the float ball operates. It is therefore necessary in some

Fig. 9. A large perforated metal suction strainer

cases to use special schemes to accomplish more frequent stopping and starting. One such scheme works very satisfactorily and is illustrated in Fig. 12.

Special Automatic Control

Two spark plugs, with the grounded point broken off and with an insulated copper wire soldered to the porcelain core point, are screwed into the ends of two conduits. These conduits with the spark plugs at the bottom are installed at the pump basin in a vertical or sloping position in such a manner that they can be raised or lowered and clamped in place.

The lower plug serves to stop the pump whenever the water is lowered enough to break contact with the plug. The upper plug serves as a starting contact whenever the water raises sufficiently to make contact with the plug. The copper wire from the upper plug is connected to one terminal of the secondary of a low voltage transformer. The other terminal of the transformer secondary is connected to a relay coil, the opposite side of the relay coil being connected to the pump piping for a ground. When the water rises sufficiently to make contact with the upper plug a current flows through the circuit and operates the relay. The relay closes a contact in the control circuit of the motor starter and thus starts the motor. The lower plug is connected in series with the hold contact of the starter, thus preventing the motor from stopping until the water has been pumped below the lower spark plug. The adjustment of these plugs can be made to any fineness that might be desired. This control lends itself nicely to use where the pump suction is in a well, or wherever there is not sufficient room for a float ball to operate.

The easiest and best way to handle the dewatering problem during the deepening of a quarry is as follows: Drill and blast an area in the vicinity of the new pump location to a depth of about 10 ft. below the desired new quarry bottom. Then drill a 14-in. or 15-in. well in this loose rock using perforated metal casing. The pump suction can then be installed in this well and the water can be pumped down below the desired new bottom so that the shovel can make a cut into this loose rock and be working in dry stone.

Boiler Supply and Boiler Wash-Out Water

The boiler supply pump for the average quarry has a capacity of from 60 to 100 gal. per min. For a pump of this small capacity a triplex plunger pump will be more efficient from the power consumption standpoint than will a centrifugal pump. This point can be illustrated by the table below:

G.P.M.	Lb. pressure	Use	Brake horsepower required. Triplex	Brake horsepower required. Centrifugal	Efficiency %. Triplex	Efficiency %. Centrifugal
60	35	Supply	2	3.5	61%	35%
80	35	Supply	2.85	3.9	57%	42%
100	35	Supply	3.35	4.25	62%	48%
60	100	Wash out	4.9	10.3	72%	34%
80	100	Wash out	6.5	11.4	72%	41%
100	100	Wash out	7.7	12.4	76%	47%

The maintenance, however, is necessarily greater on the triplex pump with its various reciprocating and wearing parts than the centrifugal with its simple rotating element. The centrifugal pump is, therefore, oftentimes chosen for these small capacities in spite of its lower efficiency, and especially so if the pump is to be located in an isolated or distant location where frequent mechanical inspection is impractical.

A pump that is merely required to force water into a slightly elevated supply tank need not be designed for very high pressure. However, a pump that must supply water for boiler wash-out should probably have at least 100 lb. pressure at the pump so that there will still be sufficient pressure at the wash-out nozzle, after the water has passed through a considerable length of pipe line.

Some quarries have two separate pumping units, one for boiler supply and one for wash-out pressure, but probably the majority of quarries use one pumping unit for both purposes. The latter may be justifiable because of the smaller investment, even though the efficiency of the unit for both classes of pumping will not be as high as would be obtained from the two separate units, for the quantity of water being handled is so small that the difference in operating cost will not grow into dollars very rapidly. The use of two separate units is of course the ideal arrangement.

The triplex plunger pump lends itself well to use for either boiler supply or boiler wash-out or a combination of both.

The centrifugal pump for boiler supply only may be a single-stage pump running at around 1800 r.p.m., but if it is to be used for wash-out only, or for both boiler supply and wash-out combined, it must be either a two-stage pump running at around 1800 r.p.m., or a single-stage pump of very late design running at around 3600 r.p.m. The latter is preferable.

This high-speed, single-stage, centrifugal pump for small capacity at high pressure and relatively high efficiency is a very recent development among pump manufacturers.

Source of Boiler Water

Good boiler water at a stone quarry is usually a very difficult thing to find. If the

Fig. 11. Float ball rack located in pump basin

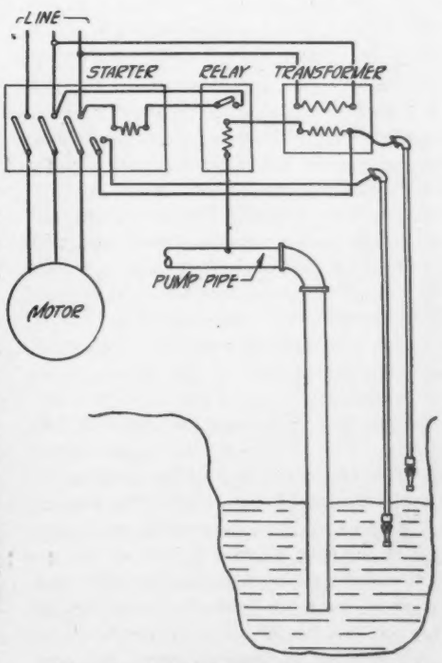


Fig. 12. Special water level control for close regulation

quarry water is very bad it will usually pay big to pump soft water for a distance of up to two miles or even more from a soft water stream or an unworked quarry hole, which has filled with rain water rather than spring water. The fitness of the water for boiler use should of course be determined by analysis prior to making an expensive pump and pipe line installation.

Boiler supply pumps can be provided with float switch or pressure regulator control so as to automatically keep the supply tank filled.

The float switch control method is quite common and is very satisfactory. However, where the pump is a great distance from the tank and quarry it might be desirable in order to eliminate the need of a control wire from the pump to the tank to use pressure regulation control.

This type of control consists of a float valve in the tank for opening and closing the line to the tank as the water in the tank lowers and rises; an air tank located at the pump and connected into the top of the discharge line, to serve as a cushioning tank; a small air-intake cock located in the suction line, to assure a continuous supply of air to the air tank; an electric pressure governor with pipe connection attached to top of air tank and electric terminals connected in the control circuit of the motor starter; and a needle valve and check valve connected in parallel and installed in the piping leading from the air tank to the pressure governor, in such a manner as to provide a time period between the time of pressure drop and the starting of the pump, thus preventing the too frequent stopping and starting of the pump.

Water Supply for Stone Washing

For years the washing of gravel has been a common and necessary practice, but the washing of crushed rock is only now becoming to be considered essential.

More stringent requirements on the part of engineers and inspectors are responsible for the recently developed necessity, in certain sections of the country at least, for the washing of crushed rock.

There is no disputing the fact that stronger and better construction can be obtained with the use of rock that is free from any coating of clay, vegetable matter or even stone dust. Therefore, crushed-rock producers, knowing full-well that the most profitable procedure in business is that which makes for permanently satisfied customers, are rapidly making preparations for washing their product. Fig. 13 shows a 12-in. pipe carrying 2000 g.p.m. to the washing screens.

It is almost an impossibility to convert already built dry-screening plants into truly efficient washing plants. However, the importance of washing is sufficiently great that the plants must be converted even though they may not be the most efficient.

The simplest method, it seems, for converting a dry screening plant into a washing plant is to pipe water into the revolving screens or over the shaker or vibrator screens, with numerous small holes or slits provided in the pipe so as to spray water over the entire stone screening area if possible, except that the very first screen in the plant should have some dry screening area to remove and save a small size of material, such as ¼-in.

Careful arrangements must of course be made to catch all of the dirty water beneath the screen in water-tight aprons and troughs and convey it outside of the building. If dripping is permitted the dirty water will find its way to the stone bins and make the stone less salable than if it had not been washed at all. Aprons and troughs made of ¼-in. (or heavier) steel plate, electric welded at the joints, are quite satisfactory.

If it is found that certain sizes of material upon leaving the screens are not sufficiently washed they can be again subjected to a spray of water in a chute provided with a perforated bottom so as to permit the water to drain away.

Recovery of Small-Sized Material

Screens, with the exception of vibrator screens, are not usually equipped with a much finer screen than ¼-in. or ⅛-in mesh. It can readily be seen that water passing through this mesh will carry with it a lot of small sized, but valuable, material which should by some means be recovered. Even if considered not worth recovering, it might be found necessary to remove it from the water in order to prevent the rapid piling up of sediment carried by the dirty water.

Fig. 13. A 12-in. pipe carrying 2000 g.p.m. to stone-washing screens in crushing plant

A comparatively simple mechanism for removing this small material is an inclined drag scraper or screw conveyor, the bottom portion of which runs in a settling tank. The stream of dirty water from the washing plant is permitted to flow at as low a velocity as possible into the tank.

In order to permit good sedimentation, the tank should be relatively large at the top, tapering in at the bottom. It should, if possible, be arranged to overflow around the entire perifery of the top, so that the overflow velocity will be low and the carry-over of stone particles will be small.

The drag or screw conveyor slowly elevates the stone particles up the incline from the bottom of the settling tank and at the same time permits the water to drain back into the tank. Finally the drained clean stone particles are discharged into a bin or car. This product contains little if any 100-mesh material and is valuable as a stone sand or fine aggregate.

The 100-mesh and finer particles that still remain in the water may still be recovered by more elaborate and costly means. Generally speaking, however, it could not be sold at a price that would justify the cost of recovery. The amount of sediment still retained in the dirty water is very small and no particular difficulty will ordinarily arise either in regard to a too rapid accumulation of sediment or to difficulty in making the stream carry its sediment suspended to some remote point where it is more permissible to allow the settling to occur.

Amount of Water Required for Washing

The correct amount of water required for this kind of washing plant is still somewhat of a question. Some manufacturers of screen equipment recommend using 1000 gal. per min. for a production of 1000 tons per day of 10 hours, or 10 gal. per min. per ton per hour. This recommendation is probably a little more than safe. It has been found in some cases at least that as low as 6¼ gal. per min. per ton per hour is quite sufficient.

The quantity of water required will differ for each specific condition. Rock that is coated with clay will probably require the full 10 gal. per min. per ton per hour, while rock that comes from the quarry in a clean and dry condition may only require 5 or 6 gal. per minute per ton per hour.

The amount of water pressure desired at the discharge point is not well agreed upon. It is felt by some that a little pressure back of the spray will help materially in cleaning the stone.

Some installations have merely enough pressure to discharge the water, while some have around 10 lb. pressure (or higher) at the discharge point. In some cases where water is scarce, greater pressure is used to clean the stone instead of a large volume of water.

Most pit quarries are cursed, so to speak,

with an over-abundance of water. Where this is the case the water may be pumped from the quarry direct to the screens and the dirty water permitted to discharge into a nearby ditch or stream, thus making the pump serve as a quarry dewatering pump as well as a washing pump. When the plant is not operating the washing pump will in many cases operate satisfactorily as a dewatering pump on the lower pumping head. A careful calculation should be made, however, before operating on the low head.

If the quarry does not provide enough water for washing the problem is more difficult. Probably the best solution of a problem of this sort is to provide a sedimentation pond (long and narrow if possible). Comparatively clean water can be pumped from one end of the pond from the dirty water discharged into the other end. It is well to put in a filter dike of crushed stone across the pond to retard the flow from the dirty to the clean end of the pond.

There will, of course, be a loss of water due to evaporation, absorption and leakage. This loss can be made up by having a small pump in the quarry to pump water into the clean end of the pond.

The direct-connected, centrifugal pump described under "Quarry Dewatering" is equally well adapted to pumping for stone washing, and practically all that applies to centrifugal pumps for quarry dewatering also applies to those for stone washing.

The Ward Pumping System

THE system of pumping sand and gravel developed by F. L. Ward, president of the Ward Sand and Gravel Co., of Oxford, Mich., has been covered by a number of patents, and the latest issued (No. 1,653,027) shows a number of additions to the device as originally patented. This was described in the Annual Review number of ROCK PRODUCTS for 1926.

The newest form, shown in Fig. 3, is designed to use air as well as water as the lifting force, the device being really a combination of air lift and water ejector. Another change is the addition of jets to the suction pipe to assist in digging. These jets are supplied with pressure water from the pump that supplies the ejector jet. A rifled discharge pipe prevents segregation.

The following description is from the issued patent:

"It is a primary object of the present invention to increase the percentage of solid to liquid material carried through the conduit, thereby increasing capacity and reducing cost of operation.

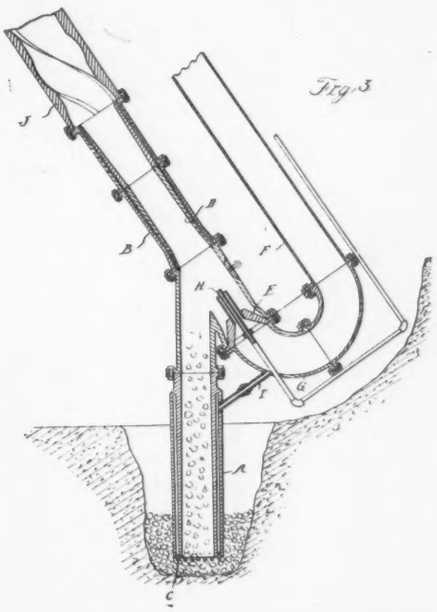
"It is a further object to use the hydrostatic pressure of the body of water beneath which the bed is located for positively lifting the material rather than depending upon the velocity of the flowing stream.

"To effectively use the hydrostatic pressure of the water for lifting the material, it is necessary first to insert the suction conduit into the material to sufficient depth to substantially seal around the same; second, to reduce the back pressure within the conduit so that the external pressure will become effective. This is preferably accomplished by the use of a substantially vertically arranged suction conduit *A*, depending from the inclined conduit *B* through which the material is conveyed upward above the surface of the water. The conduit *A* is preferably of substantially uniform diameter throughout its length and is also preferably provided with an annular series of jets *C* for loosening the material in the bed, thereby facilitating the lowering of the conduit thereinto. Adjacent to the point of juncture of the conduit *A*, and the conduit *B* there is arranged an ejector comprising a Venturi tube *D* and a nozzle *E* for directing a stream centrally thereinto. The throat of the Venturi is of a diameter equal to the internal diameter of the conduit *A* so that any material entering through the latter can pass through said throat. Also, the parts are so proportioned and arranged that all back pressure is removed from the entrance end of the conduit *A*, thereby making the external hydrostatic pressure effective.

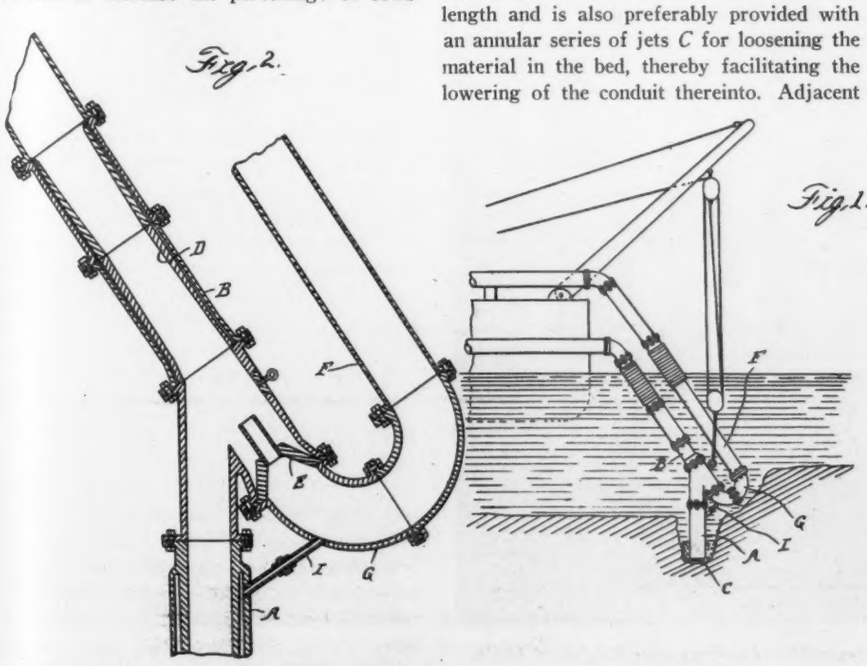
"The nozzle *E* is preferably supplied with water under high pressure conveyed thereto through a conduit *F* and return bend *G*. It is not, however, absolutely necessary that water should be used, as any fluid under sufficient pressure may be utilized in the jet for imparting velocity to the liquid column and eliminating back pressure in the suction conduit. As shown in Fig. 3, I have combined with the water nozzle *E* an inner nozzle *H* for compressed air. This will assist in developing a high pressure jet and more economically than by the use of water alone. The jet *C*, surrounding the suction conduit may be supplied with fluid through the hollow wall of said conduit.

"Where air is introduced through the nozzle *H*, to supplement the water from the nozzle *E* and passes upward through the inclined conduit *B* there is danger of separation between the air and water, the air rising to the top and the water remaining below. This can be avoided by a spiral twisting or rifling of the conduit indicated at *J*, which by inducting a whirling or centrifugal action will keep the two fluids commingled."

There are 10 claims covering both the method and the principal mechanical features.



The improved device with air jet and with water jets on the suction



The original device with the jet and suction in detail

Lime Burning Practice Based on European and American Observations

Part V.—Very Large Mixed-Feed Kilns at Hermalle-Sons-Huy in Belgium and in Germany

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

THE mixed-feed kilns of Dumont-Wautier at Hermalle-Sons-Huy in Belgium near Liege are of great interest. Mr. Dumont-Wautier has two plants, that shown in Fig. 15 is one of them; the row of masonry kilns consists of six kilns, each equipped with one of the high chimneys seen projecting in the picture. These kilns are 24½ ft. in inside diameter and 40 ft. high; the output is 80 tons per kiln per day. At the other lime plant of this concern there is a kiln even larger than these, and undoubtedly the largest kiln in existence; its shaft diameter is 26 ft. and its height 53 ft.; its output is about 110 tons per day.

One is inclined to be quite impressed by these dimensions, as well as by the high output, until some simple calculations are carried out, and the kiln performance per cubic foot is compared with the performance of the forced draft Rudersdorfer kiln previously described (April 14, 1928, p. 87). Tabulating the comparison we get:

	Rudersdorf	Hermalles	
Shaft area	63.5	540	sq. ft.
Total kiln space	2800	28,300	cu. ft.
Output per day	80	112	tons
Output per sq. ft. shaft area	2520	415	lb. day
Output per cu. ft. kiln content	57.2	7.9	lb. day

The above comparison is very interesting in that it proves that the Hermalles kilns, while large, are operating at extremely low capacity compared with what is possible.

Fig. 16 shows the kiln top; the track system should be noted, the circular track around the kiln particularly. The coal is brought up the incline, shown in the view, to the coal bunker shown in the background; from there it is distributed by the dump carts to the piles surrounding the kiln top. The kiln top is covered with sheet iron doors, which are opened and the rock dumped in directly from the carts, then coal shoveled in afterwards from the piles. This method of charging is naturally rather slow, which partly explains the low capacity. Further while the stacks are rather high and should produce fair draft, this draft cannot well exceed 1 in. of suction; this is further reduced by the very leaky kiln top to probably only ½ in. of suction. With ½ in. of induced draft available as compared with six or even more inches of forced draft at Rudersdorf the great difference in capacity is explained. For large capacity strong induced or forced draft is a necessity, and a very small kiln can make more lime than a very large one if there is draft to force the gases through the kiln.

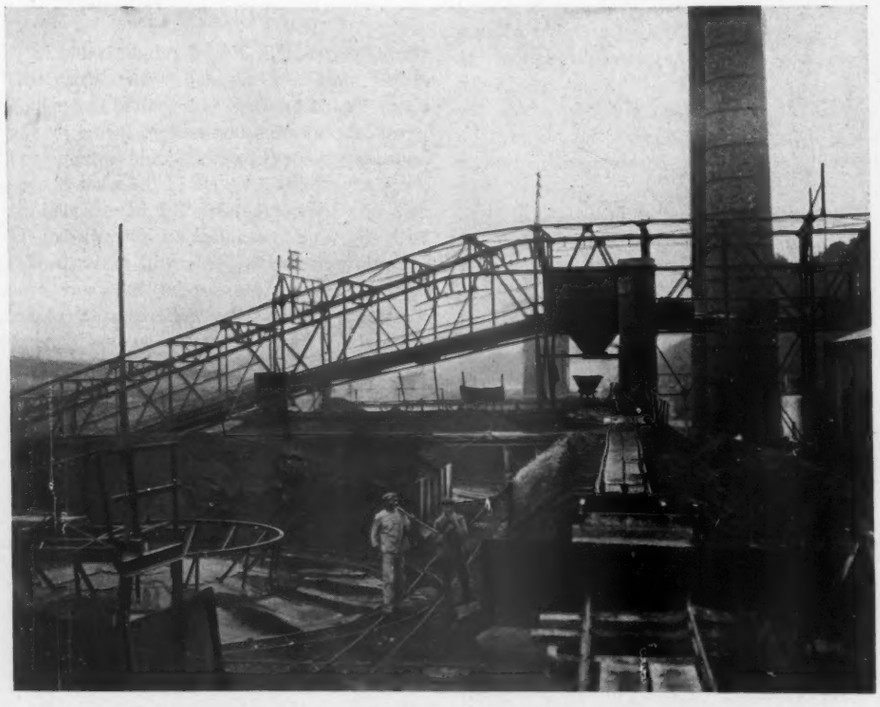


Fig. 16. The top of the large kilns at Hermalle-Sons-Huy showing that track system in detail

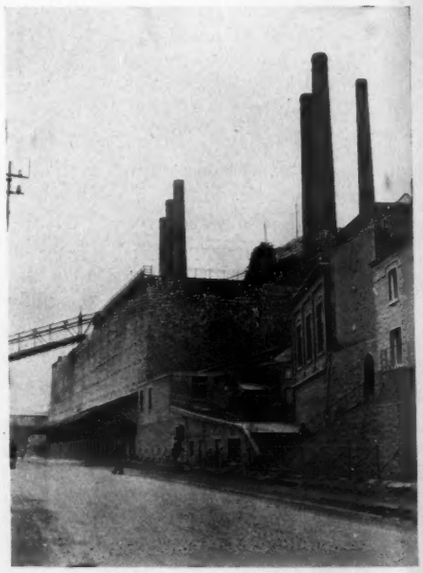


Fig. 15. The Dumont-Wautier plant near Liege has six masonry kilns

Kiln Efficiencies

Kiln efficiency in this plant is fairly high, slightly less than a 5 to 1 ratio is obtained with coal of about 12,500 B.t.u., or an efficiency of about 50 to 55%. The coal burned has a low volatible matter content, only a little more than anthracite coal. Ordinary bituminous coal of high volatile matter is not suitable for mixed-feed kilns; the volatile matter would be driven off in the upper kiln portions, and since there would be no air there it would escape unburned. Con-

Fig. 17. Dumping lime to a railroad car of the small European type

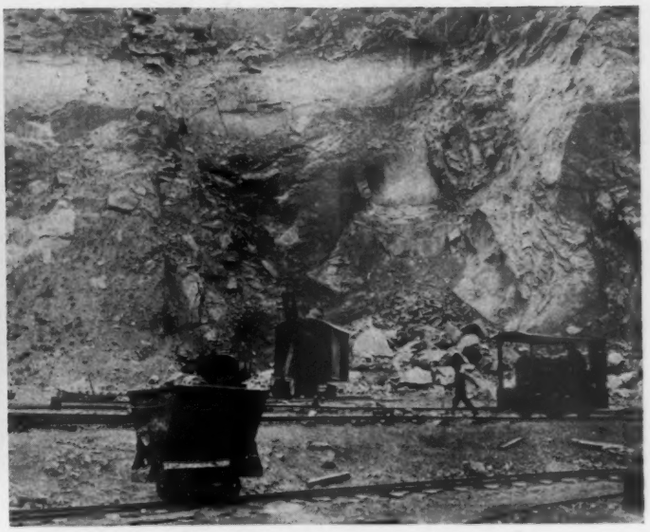


Fig. 18. Quarry of the Dumont-Wautier plant at Hermalle-Sons-Huy

sidering that of all the heat in bituminous coal the volatile matter contains around 30% to 40%, the loss of much of this would be a serious matter.

The kilns remain on the lime for a very long time; they need be repaired only once in five to six year periods. Mixed-feed kilns naturally have a rather long life, but the life of these particular kilns is exceptionally long; no doubt mainly because of the low capacity they are operated for. However, infrequent necessity for repairs is by no means an indication of low cost of repairs per ton of lime, a small kiln operated at higher rates, repaired more frequently, with smaller wall surface to repair, may be cheaper in the long run.

Fig. 20. Dipl. Engineer P. Ludowigs and Dipl. Engineer H. Siemssen

Lime Handling

The lime is drawn from the kilns into monorail dump cars and these are dumped directly into the railway cars; any core is picked out in the car and thrown into the roadway, where later it is loaded and removed. Fig. 17 shows the small typically European railway freight car, into which a man is just dumping the lime. However, in this particular case the dumping is into special steel boxes which later on are lifted out by a crane for loading canal barges located at some distance from the plant.

The limestone is of very good quality, about 98.5% $CaCO_3$, one of the purest European limestones. The quarry, part of which is shown in Fig. 18, was not of particular interest excepting for the stone strata inclining very much to the vertical. Rail-mounted Fordson tractors are used for hauling with considerable satisfaction.

Much of the overburden consists of good brick clay, so Mr. Dumont-Wautier has installed a brick-manufacturing plant, making 20,000 bricks a day; some of these are used in his own lime kilns.

The plants owned by Mr. Dumont-Wautier produce about 1300 tons of lime per day, over 150 tons of cement, which is made from clinker obtained from the steel works around Leige, and the above mentioned quantity of bricks. In addition he makes hydraulic lime by admixture of the steel plant slag to lime. His plants for Belgium and France are probably the most advanced. The very large kilns he has built indicate this. While as was mentioned the capacity based on size was low, at the same time the simplicity was great and the amount of power necessary very low. The cost of power enters quite appreciably into the determination of highest desirable kiln capacity. Mr. Dumont-Wautier is a member of Rotary International and intends to visit the United States to attend the 1928 international convention.

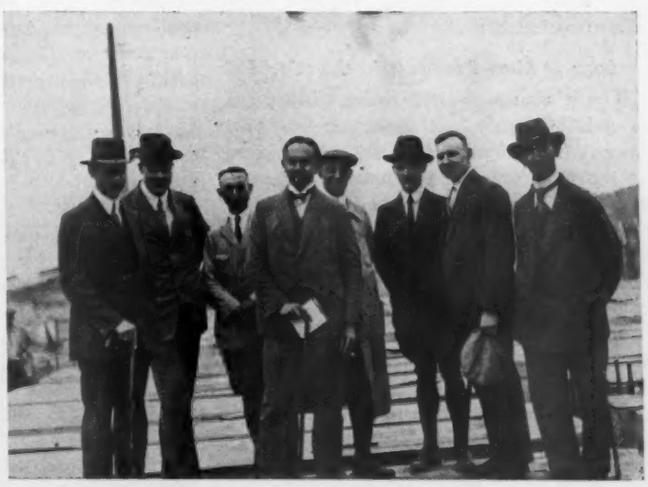


Fig. 19. Dipl. Engineer H. Siemssen (center), managing director of Rheinisch Westphalischen Kalkwerke, and his engineers and superintendents

I was anxious to know what pay the employes receive and was told that the amount varies between 20 to 40 francs. A Belgian franc is worth about 2⅔ cents.

These plants are located near Liege, which many will remember as the point of most intensive fighting at the beginning of the

World War. The Germans were delayed here several days until they reduced the system of forts located around Liege. It was probably this delay that prevented them from taking Paris during their first drive.

In France mixed-feed kilns are used practically exclusively and hydraulic lime is the principal product manufactured, pure limestone being very scarce. French lime kilns are not outstanding in any respect. The Hermalles plant just described is more advanced, and so for further information on the subject of lime burning we must again return to Germany.

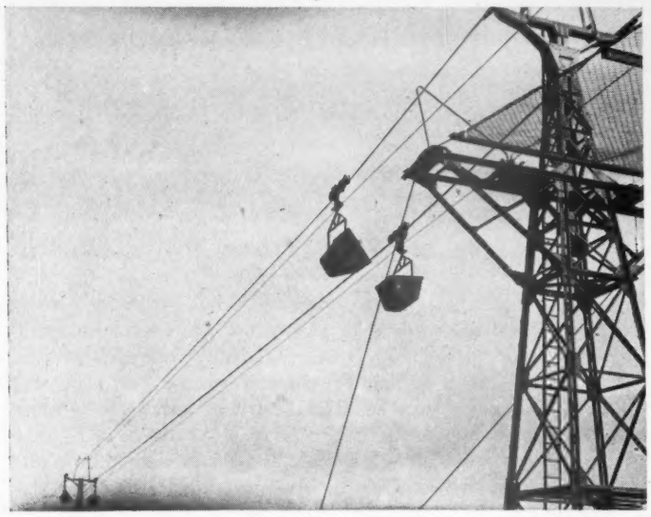


Fig. 23. Bringing stone from the quarry by cableway

Largest Lime Producer in the World

The Rheinisch Westphalischen Kalkwerke is undoubtedly the world's largest lime producer. Several of their plants were visited by the writer and were found most interesting, both in magnitude as well as in details of construction—the lime plants proper as well as the quarries. The total capacity is 3000 tons of lime and 400 tons of sintered dolomite (dead burned dolomite) per day. There are no kilns of small capacity used. Each produces in excess of 60 tons per day.

Fig. 19 presents Dipl. Engineer H. Siemssen, the managing director of Rheinisch Westphalischen Kalkwerke, surrounded by some of his engineers and superintendents. Mr. Siemssen only recently visited the United States in company with Dipl. Engineer P. Ludowigs, who is president of another large German system of lime plants (see Fig. 20).

The kilns used in the plants of Director Siemssen are either ring kilns, of which he uses quite a number, or of the mixed-feed type. Director Ludowigs uses in addition to these also rotary and large gas-fired kilns.

Mixed Food Kilns for Dolomite Sintering

Dead-burned dolomite is used to a great extent for furnace lining in the manufacture of steel by the basic process. The stone is burned so hard that it shrinks almost to the full extent possible, which does away with the pores naturally present in the lime and prevents access of air with its moisture and possibility of slaking.

Fig. 21 shows the sintering plant of Rheinisch Westphalischen Kalkwerke; It is a large and mechanically well-designed plant consisting of four kilns. Kiln height is 48 ft., with an actually useful height of about 40 ft. The kiln shaft is round and practically straight; it tapers from a diameter on top of 7.3 ft. to 8.2 ft. at the bottom, with an average cross-section of 45 sq. ft. Our American lime kiln of the ordinary type and of this size produces about 17 to 18 tons of lime. The output of these sintering kilns is, however, from 75 to 80 tons per day gross. All of this material cannot be used. The fines have to be screened out, and are a waste, with the coarser or useful portion amounting to between 55 to 60 tons per kiln per day.

Fig. 22. The base of the kiln, showing the blower for forced draft

This high kiln capacity is possibly due to forced draft, and Fig. 22 shows the base of the kiln with the blower and conections. In the blast line, the orifice plate flanges can be noted, together with pipes leading to the pressure gage. This pressure gage indicates the total amount of air flow through the line.

The stone has about the following composition:

CaO	31.72%
SiO	1.36%
R_2O_3	1.31%
MgO	19.51%

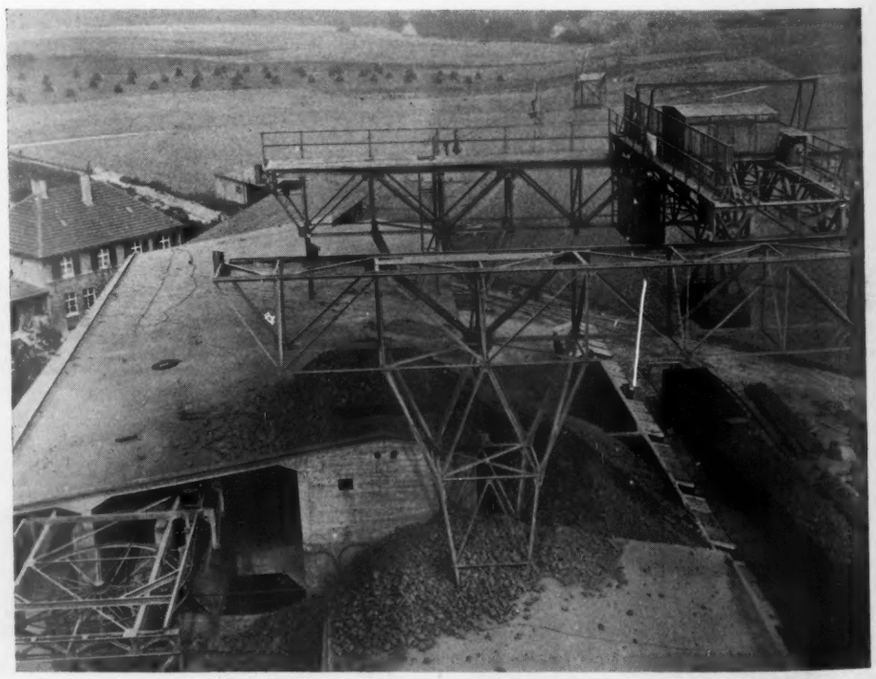


Fig. 24. Crane used for unloading coal at the Rheinisch Westphalischen Kalkwerke

The sintered product analysis is:

CaO	58.85%
MgO	36.20%
SiO	2.52%
R_2O_3	2.43%

Silica at times is somewhat higher and may be as high as 4.1% in the finished product.

Coke of about 11,000 B.t.u. is used as fuel, and the ratio on basis of gross output is about 5 to 1. This would indicate an efficiency of about 50%, which is good considering to what high temperature the charge has to be brought (to sinter dolomite).

The superintendent stated that the CO_2 obtained in the kiln waste gas ranged between 36% to 40%, oxygen from 1.0% to 1.5% and that carbon monoxide (CO) is absent. Such an analysis is of course very good, and in a way checks the figures given for the high ratio. This analysis, however, applies only when the kiln operates normally, when the air is shut off during the drawing period, the carbon monoxide content on the kiln top must be very high, judging by the way the gas caught fire and burned with the characteristic blue CO flame.

The kilns are drawn without sticking or hanging if possible. The operation of sintering kilns is, however, not so simple as that of ordinary lime kilns. The charge gets kind of pasty, and about every four weeks it hangs when attempts are made to bring it down by poking or with water. Often such methods are without success and the kiln must be cooled off.

The rotary kilns in lime plants in Germany and Austria are used entirely for sintering dolomite or magnesite. They have no such high fuel efficiency as these vertical kilns, but then the trouble due to adherence of the charge to the walls and of hanging is not so serious in the rotary kilns as it is in these vertical kilns.

Fig. 23 shows how stone is brought from the quarry by means of a cableway, this being a very popular method of conveying, and apparently quite satisfactory, especially for long distances. Fig. 24 presents the crane system used for coal unloading. Here also the stone is transferred from the cableway to bucket conveyors. The cable can be noticed in the distance.

The lesson one can derive from this plant is that such high capacity and good efficiency are possible under the difficult conditions that exist when dead-burning dolomite. It proves again that kiln capacity must and will be high, if there is fuel in the kiln and sufficient air to burn it.

(To be continued.)

The German Cement Industry

THE ABSTRACT given below was prepared from the report of the directors of the German Cement Union (Deutsche Zement Bund), delivered at the recent German Cement Manufacturers convention. It is of interest to American cement producers because it treats of problems similar in many respects to those American producers are faced with. There are certain points brought out in the report which are to be questioned, particularly the statements referring to efficiency of German production methods and the necessity for long labor shifts.

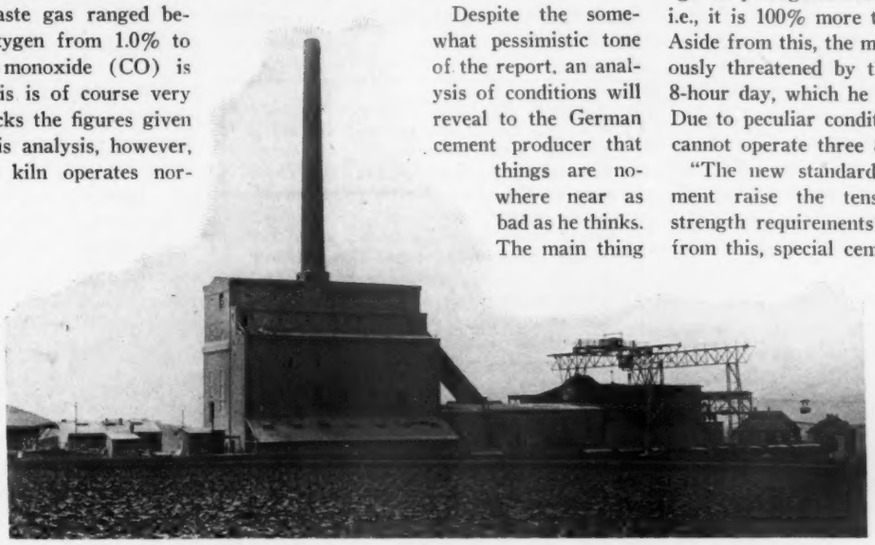


Fig. 21. Sintering plant of the Rheinisch Westphalischen Kalkwerke

Despite the somewhat pessimistic tone of the report, an analysis of conditions will reveal to the German cement producer that things are nowhere near as bad as he thinks. The main thing which must be impressed on all European cement producers is that their home market is their best market and it should be developed to the point where exports of cement have little or no bearing on the industry. The figures presented for concrete road construction in Germany show that this type of road can be exploited more than in the past, and the same is true for other construction in which cement enters.

The abstract from *Zement* follows:

"The long time elapsed since the last manufacturers' convention, in March, 1925, was due to changes in the organization, which had to adjust itself to the changing conditions of the industry. In looking back, the intervening period may be called one of 'rationalization.' This rationalization began even before the word became a slogan, and was in progress in 1925. It brought about considerable progress in manufacturing, a rise in the quality of the product, and better preparedness for the competition on the world market. This progress took place in spite of the many obstacles which operation under pressure involves.

"Although the German cement industry has ceded first place to the United States where figures of output are concerned, it still maintains first place in production methods and quality of product. The work of rationalization was done along the lines of:

1. Mechanization of plants.
2. Raising quality of cement.
3. Increased capacity.

"In 1926 the number of men employed was lower by 9000 men than in 1913. The annual output per worker thus rose from 266 (tons?) in 1913 to 370 (tons?) in 1926. However, this saving of 40% was accomplished by installation of costly equipment and technical progress in the industry, was of no benefit to the manufacturer, as it was absorbed by the rise in wages. The average wage of 4 M. in 1914 rose to 7.10 M. in 1926, and at the present time, 1927, the average daily wage is even higher than 8.00 M., i.e., it is 100% more than the pre-war scale. Aside from this, the manufacturer is continuously threatened by the introduction of the 8-hour day, which he is constantly opposing. Due to peculiar conditions of the industry it cannot operate three 8-hour shifts.

"The new standard specifications for cement raise the tension and compression strength requirements by about 40%. Aside from this, special cements are furnished for reinforced concrete construction, which have early high initial and final strengths permitting quick removal of forms. The present specification of 250 kg. at 3 days for these special cements is equal to that attained under earlier specifications at 28 days. The tensile strength specification is 25 kg. in 3 days.

"Increased production capacity, which involved tremendous investment of capital, has reduced the ratio of demand to capacity. Before the war the plants operated to 70% of their capacity produced 7,000,000 tons, the capacity being 10,000,000 tons; at present the demand is approximately at the same figure, while capacity has increased to 12,000,000 tons, making per cent operated about 60%.

The total sales since 1925 show an increasing tendency, but do not parallel the increase in capacity. They have been greatly handicapped by such uncertainties as the building workers' strike in August of 1925, the general drop of building in western Germany due to lack of capital and brief seasons.

"The industry is suffering greatly from excessive taxes. The total state income from taxes was 5,000,000,000 marks in 1913; it is now 12,000,000,000 marks. However, while the general increase in taxes is 150%, the cement industry's taxes are raised over 500%, the present tax being 2.50 marks (60 cents) as compared with 40 pfg. (10 cents) in 1913.

"The German cement industry is greatly restricted in its competition on the world market, which considerably affects its prosperity. The effect was made to increase domestic demands by advertising concrete."

Notes on Sand and Gravel Plant Design and Equipment

Part I.—The Use of Cylindrical Washing Screens in Modern Methods of Gravel Washing

By A. L. Munro, Chief Engineer and D. D. Barnes, Sales Manager
Smith Engineering Works, Milwaukee, Wis.

AMONG sand and gravel washing plants designed and built within the last few years there has been evident an increasing tendency towards the use of the cylindrical type of washing screen. This is true of the largest commercial plants as well as the smaller operations. As a result, there have been some radical and interesting improvements in this type of screen, and new schemes for fitting it into the gravel plant, making it more efficient and more popular than ever before. To account for this increasing preference, to outline some of these improvements in design and methods of use and to show and discuss various modern sand and gravel plant layouts using cylindrical screens, is the purpose of these articles.

In confining our articles and discussion to cylindrical screens, no reflection is made on other types of washing screens which have given and still give good service and efficient performance. A description and comparison of various types of screening devices accomplishes no definite purpose and our idea in sticking to one particular type of screen is to make the value of these articles as great as possible to the operator or prospective user.

ROCK PRODUCTS realizes that the sand and gravel industry wishes more information concerning methods and equipment than can be found in the descriptions of new plants, however interesting these may be. To meet this demand it has persuaded the authors of this article, who are very busy men, to furnish a series on sand and gravel plant design and equipment. Although the company with which they are connected makes other types of screens, for example, they have chosen to write only of a type that is made by all screen manufacturers and is perhaps in more common use than any other, and this policy of writing of methods from a purely engineering standpoint has been carried through the series.

The authors have designed and built a great many plants throughout the United States and are familiar with the conditions that have to be met in every part of the country. There is no feature of the designs that they have worked out that is not founded on experience. Other articles of the same tenor will follow during the present year.—The Editors.

The Modern Cylindrical Screen

The first cylindrical screens for sand and gravel plants were merely adaptations of the ordinary screen used in stone crushing plants. No provisions were made for scrubbing the material nor for retarding its flow through the screen (as is necessary due to the volume of water going with it) nor for protecting the bearings from the sandy water. Even with these disadvantages, the simplicity of these pioneer outfits justified their use. It was not very long before the operators and manufacturers began to remedy these defects and the present cylindrical washing screen is a machine designed especially for the sand and gravel field.

Various types of scrubbers have been added to the unit, bearings have been so placed and designed as to have as long life as in any dry operation, and parts subject to wear have been protected or made of the best available wear resisting material. The early scrubbers have been greatly improved. They are now leakproof and so designed as to insure effectiveness in breaking up clay balls and detaching other undesirable matter.

One of the recent types of cylindrical washing screens is specially designed for operations where a high percentage of clay presents an unusually difficult washing problem. This washer makes use of the ball mill principle to break up the clay and scour the gravel. In this screen the coarse gravel is used as a grinding agency to wear down and destroy the clay balls. The scrubber is divided into compartments by means of retarding rings, which allow the finer material to pass but which hold back the big rocks. Some of these compartments are perforated to pass the water and sand, leaving the coarse pebbles free to grind up the clay balls and soft material. As this grinding action takes place, clean water is sprayed into the scrubber to help soften the clay balls and wash off the disintegrated material.

The latest cylindrical washing screens show a trend away from the use of chilled iron for wearing rings and rollers. These often developed flat spots resulting in poor and unsatisfactory operation and frequent replacements. Steel bands were tried, but it was almost impossible to keep them tight. Later construction employs steel rings and rollers which eliminate all of these troubles. With the high carbon steel rollers, better bearings are used, bearings that are completely enclosed and specially designed to keep out grit and dirt. There is also a tendency away from the use of wood frames for this type of washing screen. Wood frames warp out of shape and make the screen and driving machinery difficult to keep in line. The structural steel frames now used keep their shape and with ordinary care greatly outlast the wood frames.

In modern practice, a washing box is employed ahead of the screen to soak the aggregate before it enters the scrubber so that the full length of the scrubber can be utilized for scrubbing and scouring action. Without this device the full needed effect of the scrubber is not utilized, for part of it is wasted in mixing and soaking the material. The washing box and flume therefore perform a very important part in the successful operation of the cylindrical washing screen.

Advantages of the Cylindrical Type

In simplifying the design and operation of the screening end of the plant, the cylindrical type of washing screen offers quite a number of advantages. It is all in one unit and on one frame, making it easy to install and line up, simple to drive and cheap to maintain. It requires less headroom than other types and permits the use of the ordinary box-shaped bin. It greatly simplifies the chutes required from the screen to the bins; and the expense of chute maintenance is subsequently reduced. Another most important advantage of the cylindrical screen is in mixing various sizes of aggregate which is necessary in many modern operations. Mixing hoppers may be readily installed between the screen and the main bins with very little change of standard design and with no loss of headroom.

In the cylindrical washing screen, the length of the various screen sections can be portioned to the work to be done, assuring more accurate classification. The single jacketed type of cylindrical screen is recommended for two reasons. Replacement of screen sections is an easier and quicker job; and peripheral speeds can be kept within the proper limits for both the main barrel perforations and for the jacket. In the double jacketed type of cylindrical screen, inner sections are difficult to replace; and if the inner sections are run at the proper peripheral speed, the second jacket peripheral speed will be too great for efficient operation. Screen sections for a plain single jacketed cylindrical screen are less expensive and much easier to replace than on screens of other shapes.

The sand, which is generally the easiest element of the product to wash, is discharged first with the dirty water, greatly reducing the load on the balance of the screen and permitting more adequate scouring and rinsing of the gravel, when this is necessary, by means of sprays in the screen and dewatering chutes under it.

The best way to illustrate and elaborate the points stated above regarding the cylindrical washing screen is by reference to individual outfits, with drawings and descriptions of different combinations of sand and gravel washing equipment. These will start with the simplest type of layout and continue through with plants complete in every way.

No matter what the equipment used to dig and transport the gravel to the plant, a hopper is necessary to receive the material, and a feeder should be provided below this hopper to assure a steady flow of material through the plant. About the only exceptions to this rule are pumping or dredging plants where the hopper and feeder are impracticable on account of the large amount of water handled. The feeder is a very important part of any plant. It assures a steady flow of material to the belt conveyors. It prevents overloading of the screens, improves the operation of the sand tanks and helps immensely to produce a clean, uniform product.

The Plant Layout

When a drag scraper, cars and trucks or a belt conveyor fed by a shovel or dragline is used to bring material to the plant proper there are about five different general types of layouts that can be used. The first and simplest type consists of a hopper with feeder, elevator or conveyor, washing screen, sand settling devices, bins and bin gates. Fig. 1 shows a plant layout of this kind using a belt conveyor. The belt conveyor is generally favored unless there is a shortage of space or a close coupled plant is desired. In either of these cases a belt elevator is used, as it shortens the distance between the receiving hopper and the bins. This layout adapts itself very nicely to small or medium capacity operations, particularly when there is no oversize gravel to be crushed. The plate feeder driven from the conveyor foot shaft gives an even and steady flow of material from the hopper to the belt conveyor. Its capacity is variable within quite a range and it is usually supplied with a clutch so that the flow of aggregate can be quickly cut off. The belt conveyor discharges into a washing box on top of the bins. A good flow of water is piped to the same point and mixes with the material in a violent manner, thoroughly breaking up and soaking all the sand, gravel and clay or dirt, and making it immediately susceptible to the action of the scrubber. In the flume, which carries the sand, gravel and water to the washing screen, further soaking action is obtained.

The washing screen in this plant is mounted on a plain flat deck requiring the simplest type of bin construction and super structure. Sufficient room is left between the top of the bins and the screen deck for the sand settling tank. This flat screen deck also supports the head end of the conveyor and the washing box and flume. Being assembled on one flat deck, these parts are accessible for lubrication, adjustment, repairs and replacement of screen sections. There is plenty of room on the deck to keep extra screen sections. It is also the most convenient place for the power unit to be located. Drives from the power unit to the conveyor and screen are hence very simple.

The sand settling tank is supported midway between the top of the bins and the screen deck. The stairway from the ground to the top of the plant usually includes a landing at the top of the bins so that operation of the sand tank can be readily checked.

From the scrubber the sand and water pass through the sand jacket and down a flume to the sand settling tank. This tank automatically separates the sand from the water, discharging the sand into the bin and wasting the dirty water into a waste flume. The automatic gravity sand tank is one of the most efficient and economical devices for this duty. It is simple in construction and operation, requires no power or supervision and is subject to very little wear. It dewaters down to 25% by weight.

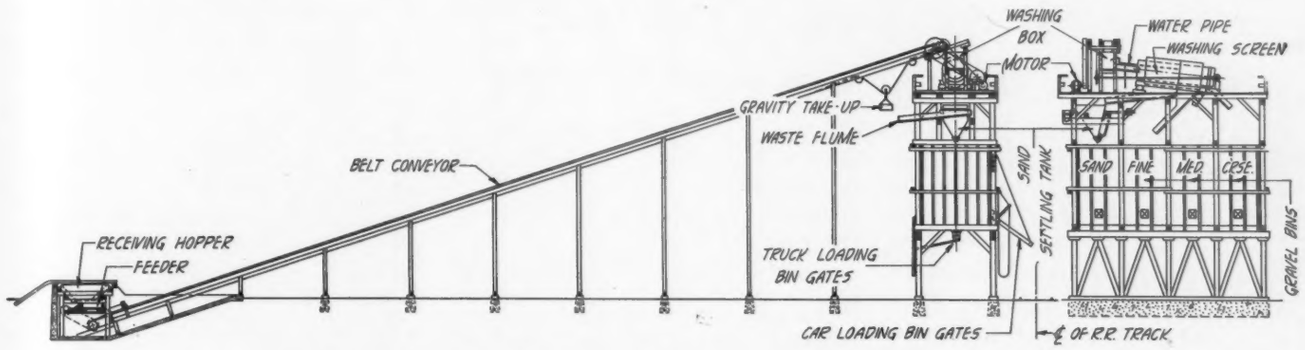


Fig. 1. Simple sand and gravel plant layout using belt conveyor

After the sand and dirty water leave the screen, the coarse aggregate is rinsed with clean water. The different sizes of gravel are discharged through the various screen sections and down chutes to their respective bins.

Chute construction in a plant of this design is very simple. Some sizes require no chutes, dropping directly from the screen into the bin. All chutes are located in the open space between the top of the bins and the screen deck making them readily accessible for adjustment or repair. These chutes can be so constructed as to make mixing of different sizes of gravel easy. Only open chutes are used, avoiding the more expensive box chute which is necessary with some other types of washing screens.

The bins are of timber construction, but steel or concrete can be used if desired. Bins are equipped with both bottom and side gates for car or truck loading.

In a pit requiring a plant of this type there is usually a large percentage of pea and small sized gravel. To take care of this condition and assure a proper separation of sizes the cylindrical washing screen can be easily equipped with extra long screen sections, and the smaller perforations can be transferred into a jacket following the sand screen, thus obtaining not only a longer section but also one of larger diameter than

in the main barrel. This results in more efficient screening.

This plant, in addition to the machinery shown, requires an excavating device, a centrifugal pump for supplying water to the wash box on top of the plant and a motor for driving the feeder, conveyor and screen. The layout includes no crusher and, where there is a percentage of oversize gravel to break up, the crusher can be installed in several different places.

The plants to be described in later articles will be complete to include crushers, feeders, conveyors, scalping screens, washing screens and sand settling devices. They will show whole operations from beginning to end, with the exception of the excavating units. These layouts will also point out the most economical and most efficient means for sand recovery and sand rewashing for dirty pits, recommended locations for crushers to prevent excessive wear and upkeep expense, methods of mixing different sizes of gravel, layouts for keeping crushed gravel separate from the ordinary run of gravel and various other features essential to the modern sand and gravel plant.

(To be continued)

British Screen Practice

Suspended Type and Multiple-Barrel Screens Are Favored

AN ARTICLE in the April 5 issue of the *Quarry Managers Journal* brings out many differences between American and British screening practice. The title is "Rotary Screens and Screening," and the author, M. A. Pool, is a quarry man and a member of the Institute of Quarry Managers.

One of the screens he favors is the suspended type, especially the type with rope suspensions. It has been used in a few American plants, but has not come into general use. He also recommends the multiple type of screen. Most American stone screens and gravel screens have dust jackets, or sand jackets, but the use of the three or four jacket screen is somewhat restricted, although practically all manufacturers of screens make this type.

A type which has never been noted in American plants consists of four small diameter screens mounted around a single central shaft. Mr. Pool says of it:

"The stone fed into the screen is divided into four parts at the feed end, and each cylinder deals with one-fourth part only of the total output or feed. It will be clear that the less quantity there is in a cylinder at a time, the better chance the stone has of getting through the screening holes, and a greatly improved sample is, therefore, obtained, together with an increased output. This type of screen is capable of dealing with very large quantities, and gives first-class separation."

Regarding the theory of screening, Mr. Pool says that the useful range of screen slope lies between 1 in. in 8 in. and 1 in. in 16 in. The commonest American practice is about 1 in. to the foot, the middle of the range given. Larger tonnages he says require a greater gradient, the speed of the screen being kept constant.

Concerning peripheral speed, he says:

"This critical speed is one which is just slightly in excess of that at which free rolling takes place. This speed can only be found by experiments, as it varies with the diameter and the specific gravity of the material being screened. If the stone is cubical, the speed should be less than it is flakey, as a cubical shape stone will roll more easily than a flat one."

He also favors small diameter screens, basing this preference on the fact that the depth of the stone bed is the limiting factor in screening. He explains that a screen with a bed only one stone deep will do the most screening and a screen with a bed so deep that the whole screen is filled will do the least. Between these is a depth of stone bed that will give the best commercial results and he places this at less than three times the depth of the largest stone to be handled.

Of the relation of stone bed to diameter, he says:

"Assuming that the depth of stone bed is fixed for a definite set of conditions, consider the effect of diameters. Let it be assumed that the maximum size of material is 3 in., and that the stone bed is to be double, that is 6-in.

"The following table gives the relative cross sectional area for different diameters of screens:

Diameter	18	24	36	48	60	72
Area, sq. in.	75	90	109	128	144	155

"These figures show that the cross sectional area of a 72-in. diameter screen is only 50% greater than that of a 36-in. diameter. This really means that a 72-in. diameter screen has only 1½ times the capacity of a 36-in. diameter screen. It should be borne in mind that, although of only 1½ times the output capacity, a 72-in. diameter screen has to be of heavier construction throughout than a 36-in. diameter screen. A 72-in. diameter screen is, therefore, more than twice as heavy and more than twice as costly as a 36-in. diameter screen. These facts not only show the fallacy of the idea that large diameter screens have high comparative capacities, but also proves the development for large capacities must lie in the use of a number of screens of small diameter."

With much of the above American screen users will agree. But they will hardly agree with the assertion made later that "the use of a battery of single cylinder screens is costly and not altogether a practical system." American plant operators, especially gravel plant operators, have found it a very practical system. It conforms to Mr. Pool's idea that several small diameter screens are better than one large diameter screen, and it also places the screens so that the products are easily sent to bins.

Mica Mining in Ethiopia

CONCESSIONS are held by an American company for the exploitation of mica mines in four sections of Ethiopia in Lake and Walloga in the west, in the country of the Ogaden near Somaliland, in the vicinity of Harar, and around Aussa near French Somaliland. Mining has been begun in the section between Harar and Jijiga, where the mica is reported to be of excellent quality, and exportation was begun in 1923. The deposits are abundant, but the exploitation so far has been somewhat handicapped by transportation, inasmuch as the mines are separated from the nearest railway point, Diredawa, by about 100 miles of very rough country. The possibility of an alternative export route, however, has been suggested, through British Somaliland to the port of Berbera, for which only 40 miles of new road would have to be constructed.

Since 1911 the concession for the exploitation of extensive deposits of potash salts in northeastern Ethiopia, near Eritrea, has been held by an Italian company, which has done some development work and exported some potash.—*Mining and Metallurgy.*

Production of Asbestos in 1927

THE total quantity of asbestos sold or used by producers in the United States in 1927 was 2986 short tons, valued at $338,066, according to figures compiled by the United States Bureau of Mines, Department of Commerce, from individual reports furnished by producers. These figures represent chrysotile asbestos mined in Arizona, and amphibole asbestos mined in Georgia and Maryland. The sales of chrysotile asbestos were much larger both in quantity and value than those of 1926, and the sales of amphibole asbestos showed an increase in quantity but a decrease in value. The figures on asbestos sold or used by producers in Georgia, Maryland and Washington were collected in co-operation with the state geological surveys.

Imports of unmanufactured asbestos for consumption amounted in 1927 to 223,693 short tons, valued at $8,150,340, and the exports were 309 short tons, valued at $48,774. Corresponding figures for 1926 were: Imports, 257,621 short tons, valued at $8,142,505; exports, 1104 short tons, $85,922.

Modern Diesel Driven Pump Dredge

Recent Type Which Solves the Problem of Transmitting Power to the Pump in an Unusual Way

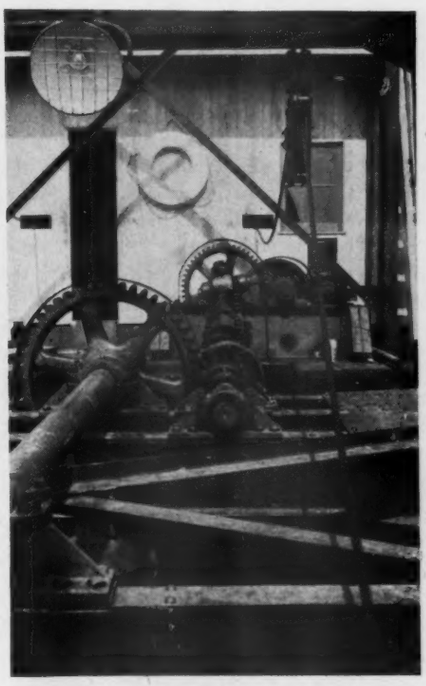
By Jean M. Allen
Consulting Engineer, Chicago, Ill.

THE growing tendency of sand and gravel producers to employ the pumping method of excavating their material, also the increasing use of rotary cutters in connection with these pumping plants, will render of interest the following description of a modern Diesel hydraulic dredge. While designed as a contractor's dredge it embodies all of the features of a sand and gravel producing plant as far as the excavating end is concerned.

Line to shore carried on steel pontoons

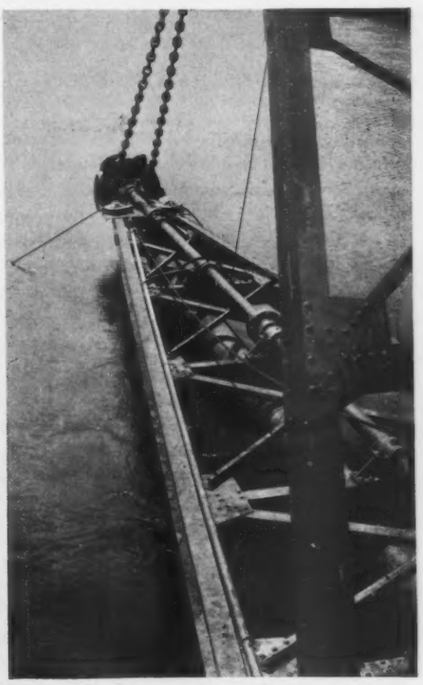
The Diesel engine is today displacing steam as a prime mover in modern pipe line hydraulic dredges to, perhaps, even a greater extent than in ship propulsion. With the exception of a few straight electric dredges taking their power from shore, nearly all of the late installations of pipe line hydraulic dredges have been of the direct Diesel or Diesel-electric type. The dredge *Natchez,* recently completed and put into operation by the McWilliams Dredging Co. of Chicago, is one of the most recent. It is a modern, steel hull, 16-in. pipe line dredge, combining both Diesel and Diesel-electric features. In general, it is of the conventional type, except in the manner of connecting the engine to the pump, which is by means of a double rope drive.

The hull, which was built by the Nashville Bridge Co., Nashville, Tenn., is of steel, 124x30x8 ft., and its working draft is 3 ft. 9½ in. No ladder well is provided, the ladder being attached directly to the bow of the hull by means of heavy cast steel trunnions. The side plating is ⅜ in., the bottom, deck and end plating 5/16 in. and the floors, deck beams and frames are 6-in. 8.2-lb. channel. Deep web floors are provided under the pump and engine foundations. There are four transverse watertight bulkheads and two longitudinal trusses. The house and living quarters are of wood, accommodations for 35 men being provided.



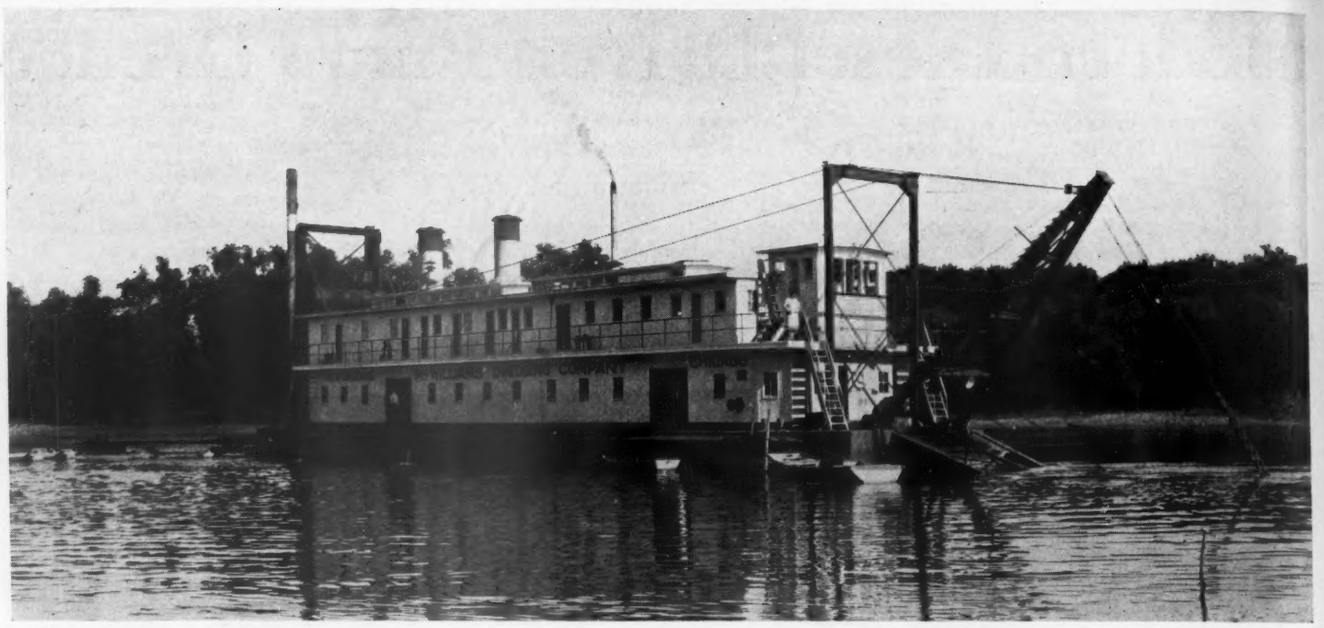
Motor and gearing driving cutter shaft

The digging ladder is of I-beam construction, 50 ft. long for a digging depth of 35 ft. The cutter is of the five blade open type with renewable blades, and is driven by a 140-hp., 220-volt, d.c. mill type motor, located on the deck and connected to the cutter shaft by a telescopic knuckle joint. The five drum hoist is of all steel construction, designed for a rope pull of 20,000 lb. at a speed of 37 ft. per minute, and is equipped with outside band frictions and lowering brakes. It is driven by a 30-hp., 220-volt, d.c. motor. The main pumping engine is a 400-hp., 200-r.p.m., Worthington vertical, four-cylinder, four-cycle, air injection engine, of the single acting trunk piston type. The cylinders are 17 in. in diameter and 25 in. stroke. The total weight of the engine is 140,000 lb.



Digging ladder and cutter shaft

The dredging pump is a standard "Amsco" pump, of the belt driven type, built by the American Manganese Steel Co., and its normal speed is 390 r.p.m. The problem of connecting the engine to the pump presented some difficulties. Because of the difference in speed it could not be directly connected. Speedup gears in connection with a Diesel engine have been tried, but in addition to being very expensive they have not been entirely satisfactory. The Diesel-electric type of drive is very satisfactory in service, but the first cost is high and it involves an electrical loss of 15% to 20% between the engine and the pump. Single rope drive transmissions have given good service, but this arrangement requires that the pump be set to one side of the engine, and the width of the hull did not allow this. It was eventually



The "Natchez," a Diesel-powered dredge of a type adapted to contract work or digging sand and gravel

decided to place both the pump and the engine on the center line of the hull and use a double rope drive, driving from the engine to a countershaft and back to the pump shaft. While some difficulty was experienced due to the close quarters and short centers involved, a very compact and satisfactory arrangement was worked out by the engineers of the Dodge Manufacturing Co. Each drive consists of 14 parts of 1¼ in. manila transmission rope arranged on the American system. It has proven very satisfactory as a drive and has the additional advantage for dredge service in that it acts as a cushion between the engine and the pump, and reduces torsional vibration in the engine.

A 200-hp. Worthington, four-cylinder, two-cycle solid injection engine drives a 135-kw., 220-volt, d.c. generator, which supplies power for the cutter, hoist, auxiliary pump and lights.

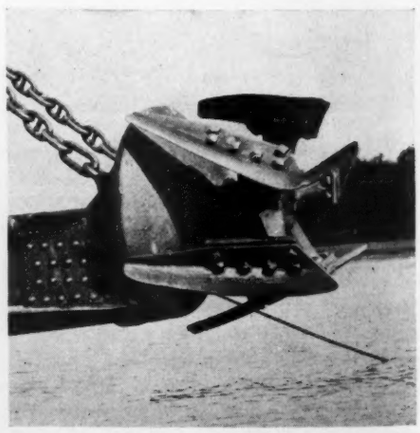
Twenty-inch wooden spuds, of southern gum, work in cast steel spud guides at the stern of the dredge. These guides are fitted with swinging gates, allowing easy removal of the spuds.

The ladder and hull pipe is 16 in. inside diameter, ½ in. thick, hammer welded pipe, with steel flanges welded on. A rubber suction hose is provided at the bow of the boat connecting the hull pipe to the ladder pipe. The discharge pipe from the pump to the stern is laid above deck, inside the house. This location facilitates turning the pipe, which is done periodically, also replacing it when worn. The stern connection to the floating pontoon line is a cast steel swivel elbow, working in conjunction with two Plummer ball joints. This has proved a very satisfactory arrangement, as the ball joints are just stiff enough to make the swivel elbow turn as the dredge swings. All of the levers from the five drum hoist are banked in the pilot house, together with the controls for the cutter and hoist motors. Ammeters showing the power taken by the cutter and hoist are installed in the pilot house near the gage board. These are very helpful to the leverman, as they are able at all times to tell the power being exerted by the digging mechanism and the strain which is being put upon the machinery.

Two motor driven, single stage centrifugal pumps are provided for general service and fire purposes, also to provide water for ladderhead and pump bearings and engine cooling water.

The cutter, hoisting machinery and spud fittings were built by the McWilliam Dredging Co. in their own shops, and the assembly and erection were done by the company's own forces. The dredge is now in operation on a contract for the United States government, in the Mississippi river, at Clinton, Iowa. It was designed by the writer.

Swivel elbow and ball joints at stern



Five-blade open type cutter

Digest of Literature on Nature of Setting and Hardening Processes in Portland Cement*

Part I.—Historical Introduction and Early Views

By R. H. Bogue

Research Director, Portland Cement Association Fellowship,
U. S. Bureau of Standards, Washington, D. C.

THE DATE AND ORIGIN of the earliest mortars and lime or gypsum cements extends back to antiquity. The discovery of the cementing qualities of burned lime, perhaps mixed with ash, must have followed closely the first use of fire: a limestone slab crumbled to powder under the heat—a rain fell, and two boulders became cemented together. Certain it is that no civilization is known which has not made use of some such material. The early Egyptians and Greeks and Romans developed the preparation and application of such cements to a fine art, and many great monuments erected by them, with the aid of these cements, have withstood the elements of destruction to the present day.

Speculations on the nature of the setting process were made by the philosophers of the day in accordance with their understanding of natural law. A description of the setting of lime with sand, given by Vitruvius[1] in the third century A. D., is rich with eloquent pristine logic. Higgins,[2] in 1780, gave the following translation of that description:

The reason that lime, when saturated with water and sand, consolidates the materials, seems to be this: Stones, as well as all other substances, are compounded of the elements, those which have most air are tender; those which have most water are, by reason of their humidity, tenacious; those which have most earth are hard, and those which have most fire, brittle. If these stones were only pounded into minute pieces, and mixed with sand without being burnt, they would not indurate or unite; but when they are cast in the furnace, and there penetrated by the violent heat of the fire, they lose their former solidity, being calcined and deprived of their strength they are left exhausted and full of pores. The water and air, therefore, which are in the substance of the stones, being thus discharged and expelled, and the latent heat only remaining, upon being replenished with water, which repels the fire, they recover their vigor and the water entering the vacuities occasions a fermentation; the substance of the lime is thus refrigerated and the superabundant heat ejected. But these stones, when taken out of the furnace, will not be of the same weight they were before they were burnt, for, if weighed, though the magnitude will remain the same, they will be found to be decreased in weight, by the evaporation of the humidity, about a third part; when, therefore, their pores and cavities are again saturated with sand and water, they unite and dry together, and by that means consolidate the materials.

There was little advance in the art for many centuries, and a decadence seems to have taken place during the middle ages in this as in many other crafts. In 1744 a treatise was published by M. Loriot, a mechanic of Paris, which bore the optimistic title, "A Method of Composing a Cement or Mortar Fit for an Infinity of Works, as Well in Building as in Decoration." According to Higgins, there was little but braggadocio in that treatise:

The first half of this essay serves only to display the sanguine hopes and lively imagination of the author, which transported him beyond the bounds of his knowledge in this subject, and all the rules of physical induction. . . . He says, "The admixture of powdered quicklime, in any mortar made with slaked lime, is the most effectual method of giving it every desirable perfection; and that this is the chief discovery which he announces." To express Mr. Loriot's discovery briefly and dispassionately, I would say, when an ignorant artist makes mortar with whiting instead of lime, he can mend it considerably by adding lime to it; but his mortar will still be defective, in comparison with the best that may be made, by reason of the old slaked lime or whiting. For on repeated trials I found this to be the true state of the case.

Higgins appears to have been a close observer of natural phenomena and discovered the basic principles of much which today is common knowledge. He writes:

I had already learned from the chaste and philosophic productions of Dr. Black that calcareous stones which burn to lime contain a considerable quantity of the elastic fluid called fixable air, or acidulated gas, which in combination with the earthly matter forms a great part of the mass and weight of these stones.

And again:

Lime exposed a considerable time before it is made into mortar, and drinking in acidulous gas all the while, the quicker as it is the better burned, is incapable of acting like good lime when it is made into mortar. . . . In London, particularly, they use lime which is burned at a distance of 10 or 20 miles or more.

Higgins recognized the necessity for using minimum quantities of water, and introduced the use of bone ashes and of leached wood ashes, mixed with lime, for making stucco.

He also suggested cement highways:

The small stones which constitute the gravel chosen for our roads could not be reduced to dust so soon as they are now by the heavy carriages if they were firmly bedded in a small quantity of coarse and good calcareous cement.

Early Scientific Studies

The conditions or constitution which, on burning, bring about the production of an hydraulic cement, that is, a cement which will harden and be durable under water, were first studied in great detail by the English engineer, John Smeaton,[3] in 1756. He had been commissioned to rebuild a lighthouse, twice before destroyed, on the Eddystone crags off the coast of Cornwall in the English channel. Ordinary mortar did not harden

Author's Foreword

CONSIDERABLE VOLUME of literature has appeared in the scientific and trade press on various aspects of the general problem of the setting and hardening processes in portland cement. A large portion of this has consisted of statistical studies on strength, permeability, volume constancy, soundness, resistance to corrosion and the like as influenced by the nature of the set as governed by fineness, temperature, humidity, curing conditions, surface carbonation, admixtures and other factors. Many papers also have appeared on various methods for measuring the time of set; especially methods based on the heat liberated during the process.

The present paper is concerned with none of these, but specifically with observations and theories based on chemical and structural phenomena that have been proposed to account for the unique property of portland cement to set and harden. The literature on this part of the subject is likewise voluminous; it would be only through extended study that one could arrive at a comprehensive understanding of our present position of progress in this field.

It is the aim of this paper to set forth in a rational manner and in proper perspective the more significant contributions that have determined opinion on the nature of the processes which result in the setting and hardening of portland cement.—R. H. Bogue.

*Publication approved by the Director of the National Bureau of Standards, U. S. Department of Commerce. Paper No. 17 of the Portland Cement Association Fellowship at the Bureau of Standards.

under water, but he discovered that a lime burned from a soft limestone rich in clay produced a mortar which met this difficulty most satisfactorily.

The criteria for determining the chemical nature of the setting process were not available to the earlier students of cements, but speculations on this aspect were advanced on the basis of chemical analysis. Thus Bergman[4] in 1780 found manganese to be present to the extent of about 2% in certain limestones which on burning made good hydraulic cements, and for no other reason attributed the excellence of this limestone to the manganese. Gayton de Morreau,[5] seeking to confirm this idea, analyzed the principal hydraulic limes of France. He found that all contained clay and one only contained manganese, but affirmed, on his faith in the Swedish chemist, that manganese is the cause of the hydraulicity of limes. This view prevailed until 1806 when Vitalis,[6] professor of chemistry and secretary of the Academy at Rouen, demonstrated that certain other limestones which contained no manganese did nevertheless make good hydraulic limes. The view was advanced by Vitalis, and confirmed by LeMassen[7] and Collet Descotels,[8] that the essential condition for a limestone to furnish good lean lime is that it contain a large quantity of siliceous material disseminated in very fine particles.

In 1819 a dissertation was published by J. F. John[9] which received the medal of the Dutch Society of Sciences for the solution of the proposition:

What is the chemical reason that limestone produces generally a firmer and more durable masonry than lime from shells, and what means may be employed to improve, in this respect, the shell lime?

The principal conclusions of John were that limestone contains clay, silica and iron oxide which greatly improves the hydraulic qualities of the calcined material. Additions of these foreign substances to the shells before burning produced a product equal to that made from the best limestones.

Vicat[10] confirmed this belief and regarded an "eminently hydraulic lime" as one made from a limestone which contained from 20 to 25% silica, alumina, magnesia, iron oxide or manganese oxide. Silica was believed by him to be most important of these and one or more of the others were often absent. He found himself unable to say just what proportions of silica, or of silica and alumina, or of silica and magnesia, etc., were required for the best cements.

Vicat discussed a number of suggested hypotheses to account for the setting and hardening of hydraulic cement mortars. He ruled out completely any chemical combination between the lime and the sand and believed there was no appreciable transformation of the lime into its carbonate. He considered the possibility of the physical matting together of the crystals during their formation, but concluded that "an hypothesis of a mere interlacement will not bear examination." On the other hand, Vicat believed that a kind of adhesion due to chemical forces of affinity accounted for much of the cementing value of limes. He quotes Macquer as saying that "the minute fineness of this substance and its extreme division, which reduced it altogether to surfaces, gives it the faculty of applying itself most intimately upon the surface of the sand, and of adhering to it with a force proportioned to the nicety and closeness of the contact."

In some experiments designed to study the causes for such adhesion and cohesion, Vicat found that considerable tenacity was developed upon kneading with water powders of such substances as had an affinity for water. The fluid then combined with the solid and produced a coherent mass which resisted rupture. But when materials having no attraction for water were kneaded with it, practically no cohesion resulted. Hence, Vicat concluded that the hardening of lime mortars was due to a chemical action of the lime with the water and that this was greatly augmented by further chemical attraction between the lime and the silica of the hydraulic limes or the pouzzolana.

Certain difficulties to the acceptance of this hypothesis were set forth by Fuchs[11] in 1832. It was shown that some substances which are known to combine with water never harden like cement. Such, for example, are the dehydrated zeolites and quicklime. Fuchs concluded that in the hardening process the lime combines with the "soluble silica" to form a new lime silicate. This represents the beginning of the soluble silica theory of hardening which has influenced opinion on the subject even to the present time.

Application of Theories to Portland Cement

Fuchs' theory was first presented before the discovery of the true portland cements, and the introduction of this high-burned product created further difficulties. Winkler[13] believed that no free lime was present in portland cement, but that free lime was formed on treatment with water and that this subsequently reacted with the soluble silica. Feichtinger[13] believed that free lime was present, but that it had been so coated over with molten cement that it could not quickly be hydrated, and hence did not manifest itself by raising the temperature of the mixture with water. Winkler argued that no free lime at all was present, because the cement failed to redden an alcoholic solution of phenolphthalein.*

Extensive investigations on the hardening of cements were carried on by Chatoney and Rivot[14] in 1856. The processes of hardening were studied with the several types of cements then in use. These authors came to the conclusion that hydraulic limes contain essentially a silicate of lime and free lime. The setting, they believed to result from the hydration of the silicate to form $3CaO \cdot SiO_2 \cdot 6H_2O$. If appreciable alumina is present, there may be formed during burning, in addition to the above, an aluminate of lime and a double silicate of lime and alumina. On mixing with water the silicate and aluminate of lime were thought to hydrate to produce the set. In this process, the aluminate was believed to hydrate to $3CaO \cdot Al_2O_3 \cdot 6H_2O$, and the free lime to react with the double compound and eventually produce the same hydrated silicate and aluminate. The natural cements made by the moderate burning of hydraulic limestone were of this type.

Portland, or high burned, cements were thought to contain complex salts of variable composition in addition to $3CaO \cdot SiO_2$, $3CaO \cdot Al_2O_3$ and small amounts of free CaO. The slow setting properties of this material as well as the increasing strengths at long periods were attributed to the slow hydration of the complex compounds. The principal hydraulic constituent in this case was said to be $3CaO \cdot SiO_2 \cdot 3H_2O$.

They believed that a replacement of lime by magnesia would result in a more durable cement because the magnesium silicates and aluminates were less soluble. The presence of $CaSO_4$ was thought to be very harmful, as it might burst the cement by a continued reaction with water and slow crystallization.

In 1865, Fremy[15] reported that very carefully performed tests with pure materials failed to indicate any hydraulic action by any of the lime silicates mixed with water. These pastes dried slowly and never presented the phenomenon of setting. The same was found with the double silicates of lime and alumina. With the aluminates, however, in compositions represented by $CaO \cdot Al_2O_3$, $2CaO \cdot Al_2O_3$, and $3CaO \cdot Al_2O_3$, excellent cements were obtained. Fremy reports that on mixing $2CaO \cdot Al_2O_3$ with 50, 60 and 80% of sand he has obtained powders which, in water, acquired the hardness and solidity of the best stone. Fremy believed the silicates to be of value by combining with hydrated lime, producing the well-known pouzzolana effect.

The advantages ascribed by Fremy to the calcium aluminates were denied by Landrin.[16] He stated that:

Although the remarkable work of Fremy has shown them (the aluminates of lime) to possess hydraulic properties, they are, however, extremely harmful compounds to the conservation in water of mortars or cements in which they are produced during burning.

This was established by experiments which showed the aluminates to be relatively soluble in water.

Landrin then demonstrated that pure silica, made by burning a silica gel, had the property, when mixed with pure lime, of setting under water. This was attributed to a chemical reaction of the silica with the lime, and explained the favorable action of the pouzzolanas.

Landrin reported further that $2CaO \cdot SiO_2$

*This appears to have been the first time that alcohol was used for the determination of free lime in portland cement.

and $CaO \cdot SiO_2$ do not set in pure water, but that in the presence of carbon dioxide the set takes place normally and the hardness increases throughout a long period.

Summary

The scientific examination of the hydraulic cementing materials was introduced by the studies of Smeaton in 1756. This engineer discovered that the presence of clay in the limestone was necessary to the production of an hydraulic material, but he could not account for this action. Bergman thought that a manganese compound in the clay was responsible for the hydraulic properties, but this was disproved by Vitalis and others who showed that good cements could be made from clays free of manganese. Vicat demonstrated the necessity of silica and alumina in the clay, and accounted for the hardening of such cements by the theory of a chemical affinity of the lime, silica and alumina for water and for each other.

Fuchs rejected the hydration theory of Vicat and introduced the hypothesis that hardening is due to a combination of the free lime with "soluble silica." On the discovery of the true portland cements there followed much controversy on the presence or absence of free lime in the product.

Chatoney and Rivot in 1856 revived and extended Vicat's theory. They contended that the setting and hardening were due to the hydration of definite silicates and aluminates of lime and of more complex double salts of three or more components. Fremy, however, insisted that only the aluminates were of value as hydraulic constituents of cements, but Landrin demonstrated that the aluminates were more soluble than the silicates. Hence structures made with them would not be desirable.

This represents the situation on the theory of the processes of setting and hardening of cements up to the period of Le Chatelier.

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(*To be continued*)

Workability of Portland-Cement Pastes

THE STUDY of workability of portland cement pastes has now included tests of three devices—the extrusion cylinder, the ball plasticimeter, and the capillary tube. The first device consists of a cylinder from which a piston forces the cement paste through an orifice, the piston moving at a constant speed.

The three methods have shown differences, in some cases very marked, in the behavior of various cements when tested in the form of neat cement pastes. Moreover, the relative order of the results is different for each of the three devices. It is apparent that this investigation must be continued to determine the extent to which the test method used influences the results obtained. Without this information no satisfactory comparison can be made of the relative workability of mortars and concretes prepared for these cements. It seems probable that the manner in which a cement is to be used should largely influence the choice of the method by which its workability is determined.

It is interesting to note that the ball plasticimeter and the capillary tube have both placed at opposite extremes of the groups of curves two cements submitted by one manufacturer. One of these cements was considered by the maker highly plastic when used in concrete and mortars, while the other cement was thought to be of a decidedly opposite character.—*Technical Bulletin*, U. S. Bureau of Standards.

Use of Early Strength Cement in Paving

AS an example of definite planning, there was carried out during the past summer in St. Louis the repaving of Washington Avenue, a major thoroughfare running through the retail and jobbing districts, in which the work was all done in accordance with the schedule out in the contract and specifications. This contract provided for the removal of an old wood block wearing surface, the greater part of an old concrete foundation, the laying of new concrete foundation, and a granite block surface with asphalt mastic filler. The contract laid down an ideal schedule which involved an elapsed time of four days from the disturbance of the old pavement to the laying of the new. On account of weather conditions and some slight labor trouble, this schedule was not lived up to in every detail, but it was very nearly met.

In this particular project, the biggest item of time saving came from the use of the early strength cement. [This was "Velo" cement, made by the Missouri Portland Cement Co.—Editor.] This cement, one of several of this type now on the market, gave strengths in two days equal to 28-day standard cement concrete. It costs less than $4 per barrel as compared with $2 for standard portland cement. With increased production of cement of this type, there is every reason to expect further reduction in price, but even at present prices the increased cost per barrel will not exceed $1.75, and the cost per square yard for 6-in. foundation will not increase more than 30 cents. This will amount to an average increased assessment of 75 cents per front foot or $30 for the 40-ft. store building. For this increased cost, the saving of ten days in the time of curing concrete is secured. There would be few merchants who would not tell you that their loss on account of street closure would not be in excess of $3 per day, and that they would gladly pay two or three times that amount to speed up a paving program.—W. W. Horner, Engineer, Sewers and Streets, in "Roads and Streets."

Tall Concrete Buildings

A DISTINCT trend toward the use of reinforced concrete for high buildings is revealed in a survey of this type recently completed by the Portland Cement Association.

South America is the most sensational adapter of the concrete building idea, the Hotel Palacio Salvo at Montevideo, Uruguay, being the highest building of its type in the world. It rises to a height of 28 stories, with its peak 338 ft. above the sidewalk level. The Palacio was finished in 1926.

The tallest concrete building in the United States is the recently completed Master Printers Building, New York City, which has 20 stories and an over-all height of 310 ft.

While the first concrete building above 10 stories in America, the Ingalls Office Building at Cincinnati, Ohio, finished in 1903, stands 16 stories high, the average number of stories for the 647 reinforced concrete buildings in this country, 10 or more stories high, is 11.9, the survey shows.

Illinois is the leader among states in construction of tall concrete buildings with a total of 110, California is second with 67, Texas is third with 57, and New York fourth with 47. The remainder of 366 buildings included in the survey are scattered over 33 states.

The survey attributes the rapid increase in use of the tall reinforced concrete frame to concrete's economy, fire safety and the speed of erection it makes possible.

Technology of Gypsum Plaster Materials*

Part III — Atomic Structure of Gypsum, Anhydrite and Calcined Gypsum—Hydration of Gypsum Phases

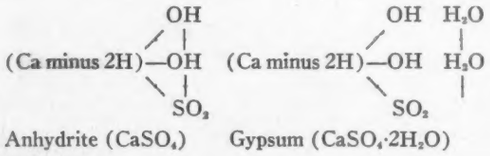
By Otto Fr. Honus

GYPSUM crystals belong to the monoclinic system and are found in nature as needle-shaped, plate or lenticular crystals, where gypsum contains two molecules water. In this form it is abundant among sedimentary formations. Anhydrite is distinguished from gypsum ($CaCO_4 \cdot 2H_2O$), as it represents the anhydrous calcium sulfate ($CaSO_4$). Anhydros means waterfree in Greek. As such it is predominant in rock salt formations, frequently alternating with strata of rock salt. Its crystals belong to the rhombic system and are characterized by three vertical lines of cleavage. In contact with water, anhydrite changes to gypsum. This process is accompanied by strong volume expansion, which frequently causes upheavals of the anhydrite strata.

Neither the crystalline gypsum nor the waterfree anhydrite have hydraulic properties in their original state. These appear when part of the water contained in crystalline gypsum is driven off at low temperature, or when gypsum is heated to high enough temperatures to permit a partial formation of basic calcium sulfate; also when anhydrite is finely ground in the presence of the proper quantity of water. Certain admixtures (catalyzers — exciters — accelerators) may produce hydraulic properties in crystalline, anhydrous and dead-burned gypsum.

As mentioned above, the anhydrous phase of gypsum has the chemical composition of $CaSO_4$. The crystalline, hydrous phase has the formula $CaSO_4 \cdot 2H_2O$. Accordingly one equivalent $CaSO_4$ is present for each two equivalents of water. The two equivalents of water are present in the gypsum in different conditions and have different functions. While one equivalent is ordinary water of crystallization, the other equivalent is present as salinic water, i.e., water which may be replaced by salts. This peculiarity is the key to many features of the behavior of gypsum.

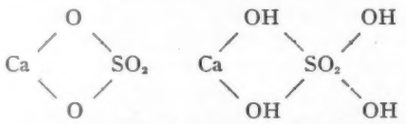
According to the latest theory, gypsum has the following structure:



Anhydrite ($CaSO_4$) Gypsum ($CaSO_4 \cdot 2H_2O$)

*Zement (1928).

Due to the affinity of the Ca, S, Si, Al and Fe-atoms to the O-atom a very interesting atomic structure is produced. Assuming that two H-atoms are chemically combined with the sulfuric anhydride of gypsum and another two with lime, the former being capable of becoming replaced by metals, the following structure is obtained:



Anhydrite ($CaSO_4$) Gypsum ($CaSO_4 \cdot 2H_2O$)

This hypothesis is confirmed by the fact, that the acid nature of the H-atoms bound by the sulfur anhydride of the gypsum may be proven by its ability to drive out the carbon dioxide (CO_2) of sodium bicarbonate ($NaHCO_3$) with consequent decomposition of this salt. According to a former interpretation, gypsum is the salt of the ditetrahydrosulfuric acid (*Gmelin-Kraut, Textbook of Inorg. Chem.*, vol. 2) $2SO_2 \cdot (OH)_4$; this affords a simple explanation of the displacement of two molecules gypsum and of the formation of the different gypsum phases. This hypothetic acid acquires interest, when the half-hydrate of gypsum is given the present-day general formula $2CaSO_4 \cdot H_2O$. This formula shows that two molecules gypsum combined with one molecule water. It is an open question whether this is but an arbitrary formula or not. Apparently, its correctness has been proven, as by heating hydrous gypsum and by driving off the water condensation products are formed, which vary greatly in their physical properties.

On this basis of the new structure of gypsum established by the author, he designates it as monocalcium-sulfate dihydrate. By heating two molecules gypsum ($CaSO_4 \cdot 2H_2O$) or monocalcium-sulfate dihydrate and driving off one molecule of water (H_2O), one obtains dicalcium-sulfate trihydrate (formerly called hemi-hydrate). Assuming that the monocalcium-sulfate has the structure given above, a condensation product of the following structure shown in formula No. 1 is obtained:

By eliminating one molecule water from dicalcium-sulfate trihydrate, a dicalcium-sulfate dihydrate of the structure shown in formula No. 2 is obtained.

Two other possibilities are to be considered, such as given in formula No. 3.

Further heating with consequent elimination of one molecule water results in dicalcium-sulfate monohydrate (formula No. 4).

By driving off the water remaining in dicalcium-sulfate monohydrate, the anhydrous phase of the following structure (formula No. 5) is obtained.

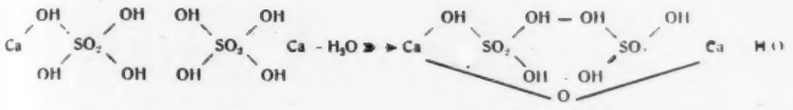
Reactions of monocalcium-sulfate dihydrate with bases and acids may produce compounds of the type shown in formula No. 6.

THIS is the last of a series of three articles on gypsum plaster materials which began in the February 18 issue. Part II of the series appeared in the issue for April 14, and contained a discussion of the properties affecting the setting time of gypsum, together with an account of empiric tests with various limes to determine strength.—The Editor.

Anhydrous Phases of Gypsum

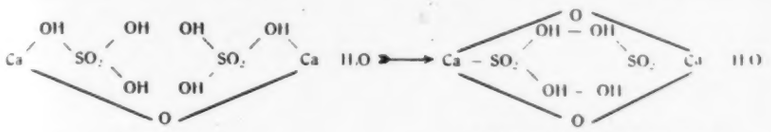
It is thus demonstrated that there are two anhydrous phases of gypsum, the monocalcium sulfate ($CaSO_4$) and the dicalcium sulfate ($2CaSO_4$). The main difference between them is that monocalcium sulfate reacts with water very slowly and with difficulty, while dicalcium sulfate gives a rapid reaction. The densities also show differences. Natural anhydrite is monocalcium sulfate. Dicalcium sulfate is produced artificially by precipitating soluble calcium salts with diluted sulfuric acid or with soluble sulfates, followed by driving off of the water at 80 to 100 deg. C. Apparently Moff (*Tonind., Ztg.*, No. 36, p. 429, 1902), K. Kraut (*Liebigs Ann. Suppl.* 4, 126, 1865) and Gunning (*Dinglers Polytechn. Journ.*, p. 1451, 1871) have known this compound and have observed that the product, when heated in a steam bath for some time, gives off all of its water, whereupon it reacts quickly with water.

Aside from these two anhydrous phases, there exists a third, namely, dehydrated gypsum, whose structure is not given here. Dehydrated gypsum differs from dicalcium



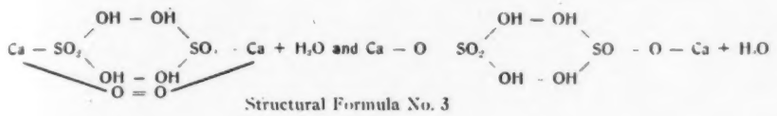
Structural Formula No. 1

Dicalcium sulphate-trihydrate = $2CaSO_4 \cdot 3H_2O$ or $CaSO_4 \cdot 1.5\ H_2O$

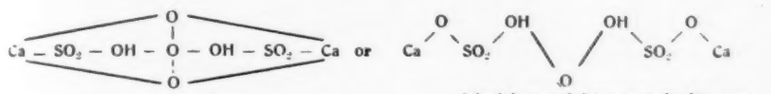


Structural Formula No. 2

Dicalcium sulphate-dihydrate = $2CaSO_4 + 2H_2O$ or $CaSO_4 \cdot H_2O$



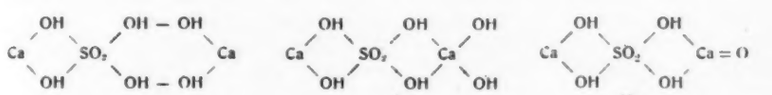
Structural Formula No. 3



Structural Formula No. 4

Dicalcium sulphate-monohydrate = $2CaSO_4 \cdot H_2O$ or $CaSO_4\ 0.5\ H_2O$

Structural Formula No. 5



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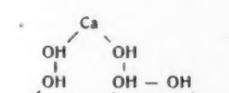

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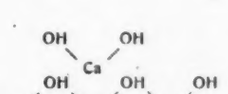

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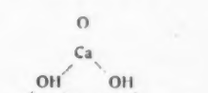

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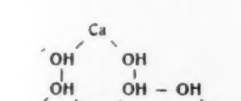

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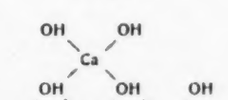

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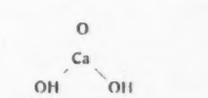

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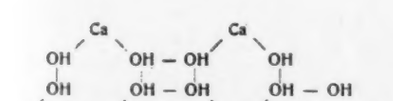

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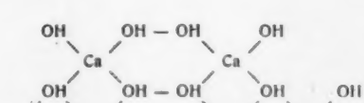
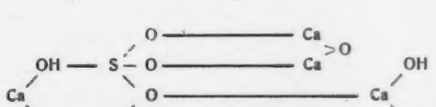


4a

Structural Formula No. 6



4b

sulfate by slowly reacting with water. It is the author's opinion that dehydrated gypsum is beside the point in this connection, as it represents a mixture of gypsum and calcium oxide. Considering that at 1300 deg. C. dissociation of gypsum reaches the point when it contains about 3% CaO, its composition may be written as $12CaSO_4 \cdot CaO$. Assuming that at this temperature lime and gypsum react to form basic calcium sulfate ($CaSO_4 \cdot CaO \cdot CaSO_4$), we still deal with a mixture of basic calcium sulfate and gypsum. As dehydrated gypsum is a mixture of gypsum and basic sulfate, it does not come under the classification of pure gypsum phases. In view of the many contradictory theories on dehydrated gypsum, the author leaves this subject open to discussion. Free lime or the basic sulfate formed during heating have the same effect on the setting and hardening of dehydrated gypsum, as gypsum in portland cement, whose set it retards. On the other hand, setting and hardening of dehydrated gypsum is similar to that of Sorel cement, in which oxide and chloride react with each other. The effect of $MgO + xMgCl_2$ may be paralleled by that of $CaO + xCaSO_4$.

Dicalcium-sulfate trihydrate or hemihydrate differs from dicalcium sulfate-monohydrate or half-hydrate in that, the former sets with water in 7 minutes and 30 seconds, and the latter sets in 4¼ minutes.

It can be proven by microscopic and ultramicroscopic means that a gel is formed during the hardening of pure hydraulic gypsum derivatives, which cements the individual particles. The mass also becomes interspersed with crystals, so that a hard, strongly cemented product is the result. Assuming that the dihydrate separates from the super saturated solution as a gel and that in this gel develops a tightly interwoven coagel of crystalline dihydrate, the process is explained in a simple way. Observations by Wo. Ostwald and Wolski (*Kolloid-Ztschr.*, 27, 1920, p. 979; Cavazzi, *Kolloid-Ztschr.*, 12, p. 196, 1913) favor the existence of this process.

The soundness under water and the hardening of the products herein described by the author are brought about mainly by the formation of a highly basic gypsum compound, soluble with great difficulty. The products obtained at the temperatures mentioned are stable, but become hydrolytically dissociated in contact with water and form crystals, this crystalline formation being accompanied by the formation of a gel. The two processes are instrumental in bringing about hardening of the mass. In this case one can speak of combined hardening, which in part resembles that of portland cement and in part that of pure gypsum plasters, the hardening being due to the basic calcium sulfate, calcium silicate and calcium aluminate. During hydration there are formed: monocalcium-hydrosilicate, a hydrous tricalcium-aluminate, basic gypsum, crystalline gypsum and some free lime which is liberated as calcium hydroxide [$Ca(OH)_2$].

Electrical Hazards in the Cement Industry

Causes and Prevention of Accidents in Mills

By R. J. Hawn
Vice-President, Phoenix Portland Cement Corporation, Birmingham, Ala.

WE ARE OFTEN REMINDED that this is an age of electricity. Nowhere is this more true than in the cement industry. All of the newer mills are completely electrified, and the older ones are following a rapid trend in the same direction.

Not only is the cement industry electrifying to somewhere near the 100% point, but its power requirements are rapidly increasing. The mills are being equipped with more ample grinding equipment; larger repair shops, with motor-driven machines; dust precipitators and collectors and other mechanical devices are requiring the generating, handling and use of more power. At present there is also a decided movement toward better lighting.

The modern cement mill has a large and elaborate electrical system. Whether the mill operates its own generating plant, with or without waste-heat boilers, or is purchasing and transforming its power, an extensive installation is required to distribute, control and use the power. Electrical lines and equipment are necessarily so prevalent about the modern cement mill that every safe worker must possess a wholesome respect for the dangerous current and common sense enough to avoid cables, switches and other electrical apparatus except by direct order of the electrician or his department foreman, under conditions which he must understand thoroughly when the order is issued.

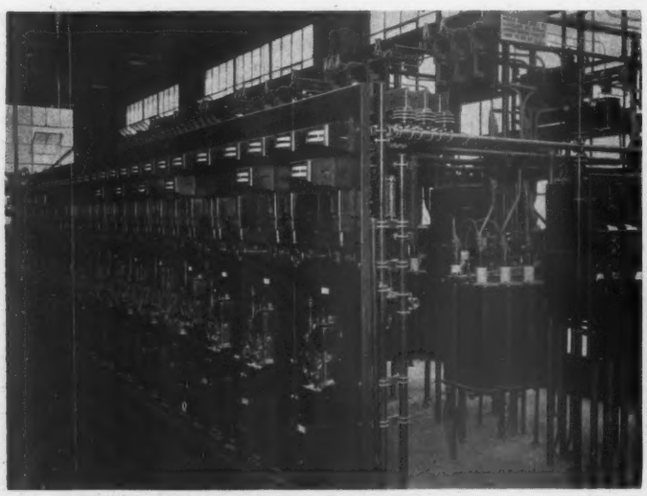
Although it is true that our hazards are large and they have been increasing, electrical accidents are altogether too numerous in the cement mills. Records show that there are many fewer accidents included in the total from all causes than was the case formerly, but the reductions have not been proportionate so far as electrical mishaps are concerned. A large proportion of these accidents must be laid to sheer carelessness—violations of plain, every-day rules, most of which have been understood since the days of the carbon lamp. The elimination of electrical accidents depends upon proper design, installation, operation and maintenance of electrical equipment and lines.

Design a Big Factor

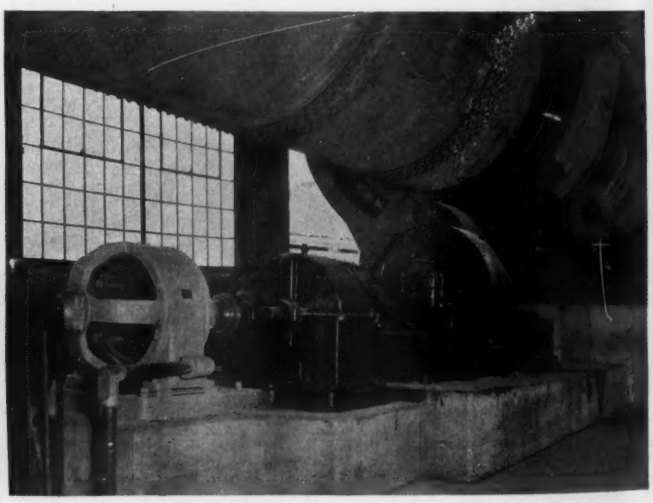
At the design stage it is possible to head off much trouble which later on might be charged to improper installation, careless operation or slovenly maintenance. For example: In the design of a plant it is an easy matter to eliminate about 95% of the chances of making accidental contact with power lines by putting them in conduits, underground for the most part. Plants not so protected furnish a number of accidents of this kind every year. Therefore all new and reconstruction jobs involving the power department should include putting the lines in conduits.

So far as possible we believe it is a good move to put all electrical apparatus where it is not likely to be touched accidentally; often it is also wise to set the equipment up where the men will not get too "familiar" with it and where it will not attract the attention of the curious. It is now considered good safety practice, as well as good operating sense, to provide plenty of space around the equipment for convenient handling and plenty of light. Adequate lighting with good distribution enables operators and repairmen to see where they are going, overhead or down below, in the building or out into the yard, and no plant can afford to be without sufficient light, either from a safety or a production standpoint. Many engineers recently have been advocating the use of large light units, keeping the number at a minimum.

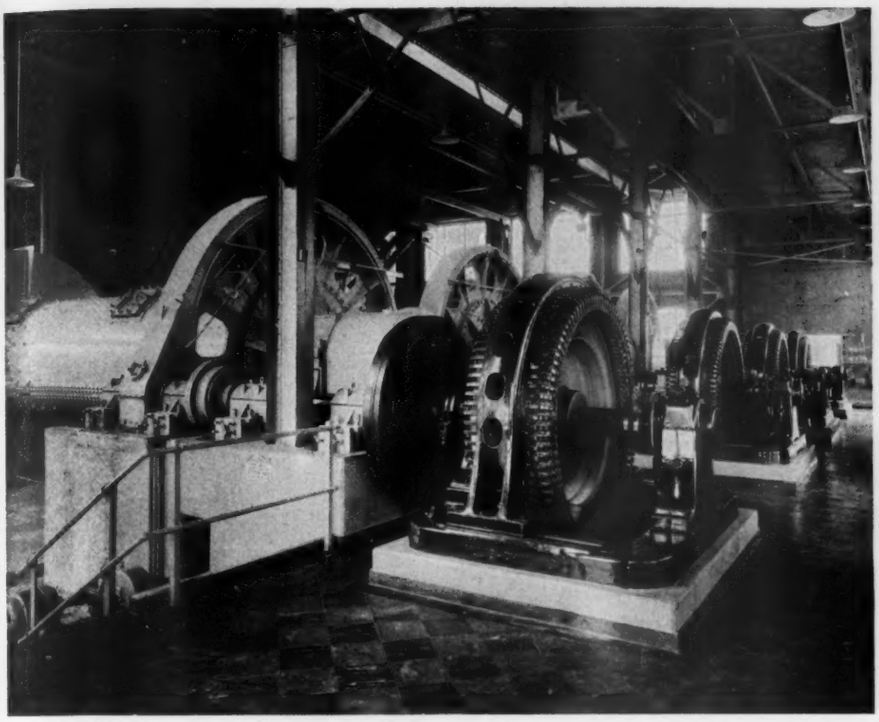
Much electrical equipment can be surrounded with guards or enclosed under lock and key. Numerous other steps can be taken during the process of design, depending on the exact nature of the layout and equipment to be used. Manufacturers of the latter have made much progress in removing various hazards and are constantly improving, although they still have a long way to go. The ideal in this respect is to make



A main plant switchboard which is well laid out and in perfect order



Motor gearing completely housed and power lines totally enclosed



Hazards are reduced by plenty of light, scrupulous cleanliness and ample spacing between the electrical units

equipment which is not only electrically perfect but also as nearly mechanically perfect as can be made. There is no economy in the purchase of second quality electrical apparatus and supplies.

Switch Blow-ups

The Portland Cement Association reports show that there are altogether too many switch blow-ups in the various mills. Some months several have been reported. It is my impression that these are about the most numerous electrical accidents we have and that they are all very serious. Many of them are fatal. While we must put most of the blame on careless operation, where it obviously belongs, these accidents are being reflected constantly in improved switch and control design, and improved design will do much to eliminate this trouble. One of the leading switch manufacturers recently submitted the following test report which comes from a mill in the Lehigh valley:

CURRENT BREAKER TEST

Apparatus Used—Allis-Chalmers motor, 35-hp., 550-volts, 60-cycles.

Recording Instrument—Esterline recording ammeter, Series No. 11379, with multiplying factor of 80. Chart feed 12 in. per min. during breaks.

"Switch was set up, mounted on steel pillars automatically grounding the box back to their transformer system.

"First test conducted—switch making and breaking a circuit three times carrying a starting load of 208 amperes.

"Second test—stalled rotor with barriers, box cover open—switch operated three times making and breaking a load of 308 amperes. After the third cycle the right-hand blade had to be dressed with a file due to copper forming on it. The test was then conducted for a period of 17 cycles making and breaking a load of from 300 to 312 amperes. Following the above 17 cycles the barriers were removed from the switch, box cover being left open. The switch was then operated eight times making and breaking a load of approximately 300 amperes.

"In the next test, the box cover was closed and the barriers were removed and the time taken between each break was approximately 15 seconds. The switch was operated 5 cycles at the above intervals making and breaking a circuit from 300 to 306 amperes.

"In the next test, barriers removed, cover closed, main breaker left on, stalled rotor continuous make and break test. To accomplish this a long stick was attached to the handle, being fastened with tape and rope and the switch operated as fast as possible, making and breaking a load of approximately 300 amperes. This last test was to bring out a prefixed stalled machinery on their equipment, as the plant engineer had stated that sometimes their equipment would stall and the operator would repeatedly jog the switch in and out and try to get the machinery started again."

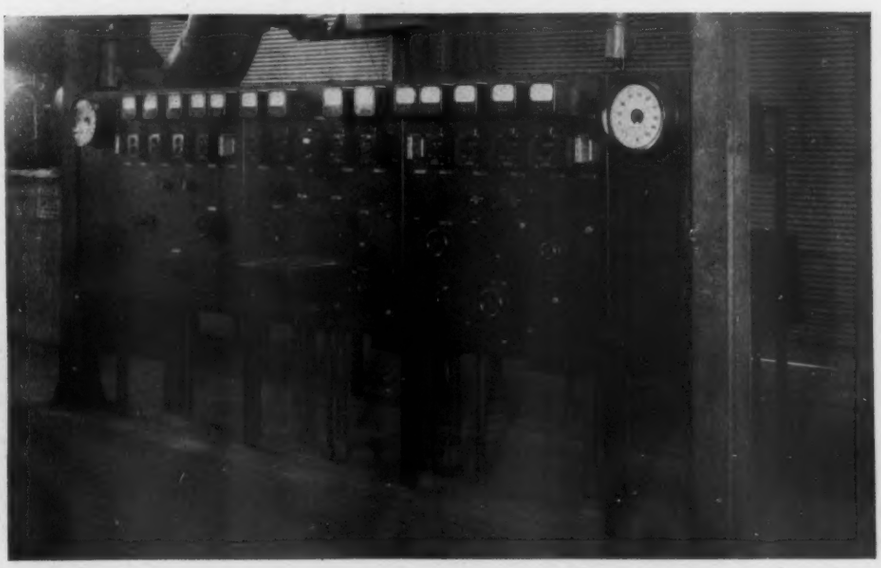
Installation Important

A long step toward the elimination of electrical hazards was taken when the idea of grounding all metal parts, except those carrying current, began to gain headway. Today everyone agrees with this idea in principle, but the careful installation and maintenance of these grounds is not always taken with due seriousness. Effectively insulated platforms or mats should be installed before all switchboard and operating locations.

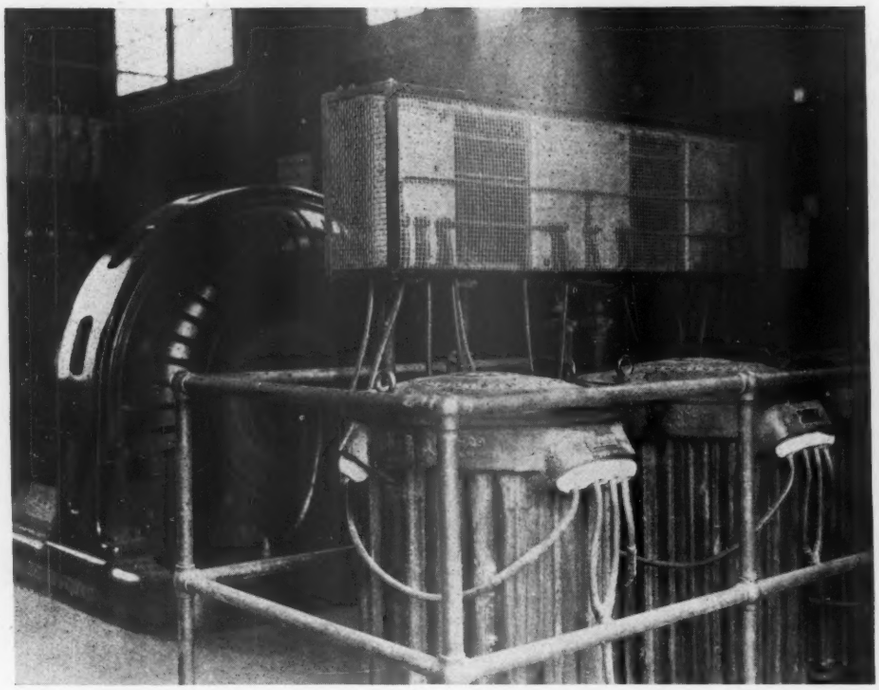
Careful identification and plain marking of all lines and equipment is not only a convenience worth many times the cost and trouble involved, but no plant is electrically safe until this has been done.

The problem of making the mill safe can be greatly simplified by intelligent location of control devices. A sufficient number of push-button "stop" stations for motors should be installed at convenient points, and wherever possible these should be located at points from which the operator can clearly see the machinery which is being controlled. Hand-operated starters should be eliminated as far as possible.

Outlets for extension lights and electrically operated hand tools must be of proper



Kiln control board showing ample spacing, neat surroundings, and use of conduits, three safeguards which prevent electrical accidents



An installation of uninsulated wiring protected by a grounded wire cage

type, sufficient in number and conveniently located. It is thoroughly advisable to use heavy rubber-covered cable for extension lights as well as weatherproof sockets and proper cages for the light bulbs.

New or rebuilt installations of all kinds should be subject to thorough inspection before use.

Careful Operation Constant Problem

There is plenty of evidence to show that careless operating is to blame for more electrical accidents than any other single cause. The situation has led a number of very good cement mill operators to place all important operating controls in the power house, so that no employe outside of the power department throws the power on or off, except when necessary to operate emergency push-button stops. The power department in such case becomes the hub of a telephone dispatching system.

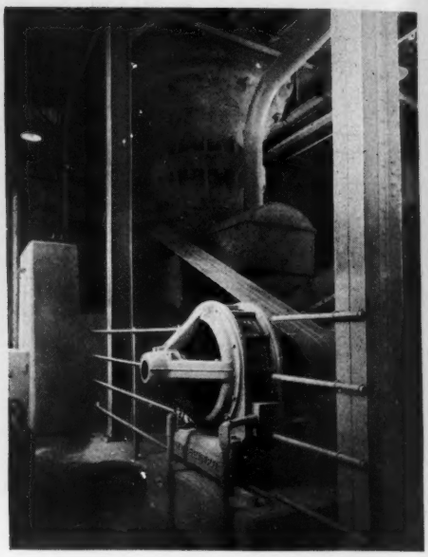
The advantage of the central control system of this kind is that it concentrates all electrical manipulation in the hands of an operator who is a specialist, working directly under the supervision of the chief of the power department.

The starting of motors during the course of repairs on machinery has often caused horrible accidents. Locking devices should not only be on all control switches, but every repairman should be provided with his own lock and the foreman should see that he uses it. Disregard of this procedure is ample grounds for dismissal.

A case recently came to my notice which illustrates the need for constant watchfulness in the stopping of motors. A kiln room foreman wished to stop a kiln. He pressed the stop button, presumably in an absent-minded manner, and did not realize as he removed his hand that he had not pressed the button far enough to actuate the switch. Then, without looking to see whether the kiln had stopped (which of course it had not) he opened the main disconnect switches. The switch box was burned out and the workman sustained injuries from which he died soon after.

As typical of the general run of electrical accidents chargeable to careless operating, one of the eastern cement companies recently reported the following accidents, each of which occurred at a different mill:

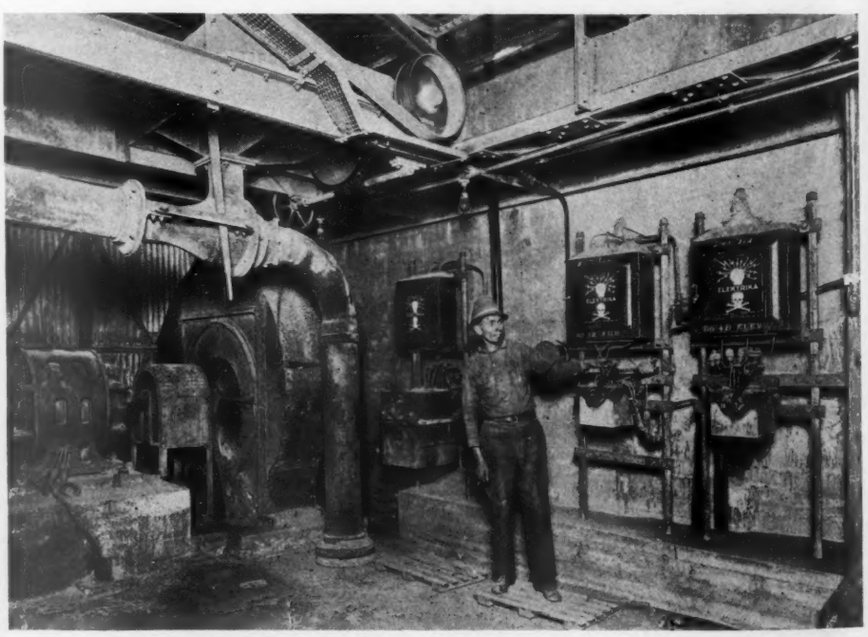
A kiln burner who was experiencing trouble to start a kiln, due to the belt slipping, during his repeated efforts neglected to return the starting control to its proper position before throwing in the switch, causing severe burns about head, face, arms and hands. Even though this was a safety cut-out switch, failure to keep his mind on what he was doing caused his accident. Time lost due to this accident amounted to 99 days.



Pipe railing guards and conduit for electric lines used to prevent accidents

While throwing an electric switch, the rock dryer tender was burned by flash from the switch. Loss of time, 11 days.

When the electrically charged contact brush came off the third rail, a quarry laborer pushed this brush back on to the third rail and was burned by the flash.



Switches provided with insulated platforms in front and conduits carrying the electric lines

Illustrating the improper use of a switch box as a "catch-all"

Time loss in this case was 27 days.

The first requisite for safe operation of the mill electrical equipment is to have a fixed code of operating procedure carefully worked out and made well known to the workmen by means of printed copies which can be given out to individuals and posted about the mill. Then, operating authority

Working on a switch box with the switch closed

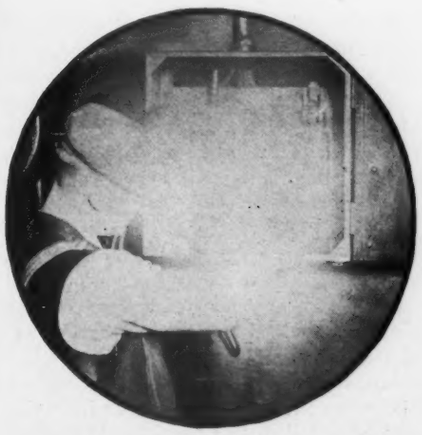
should be limited to as *few men* as practicable and all others be given definite instruction covering emergency stopping of machines, to be exercised in actual emergencies only.

Maintenance

Money is always saved by keeping electrical installations at the highest state of efficiency. Maintenance and replacement work, like new installations, should be made under expert supervision only. The maintenance force should be thoroughly familiar with special and emergency equipment of every kind. The way to prevent accidents in this kind of work is to follow a code of maintenance procedure comparable with that recommended for operating. It might be known as "Safe Practices for Repair Work."

Before repairs are undertaken on power lines they must be "killed" by those authorized to handle the switches and then locked dead and positively grounded on both sides of the working location, at the closest practical point.

Operating men cannot be reminded too often of the value, from a safety viewpoint, of frequently testing out their grounds on all metal parts which are not "live." Grounds have to be maintained; once established, they cannot be relied on to remain indefinitely.

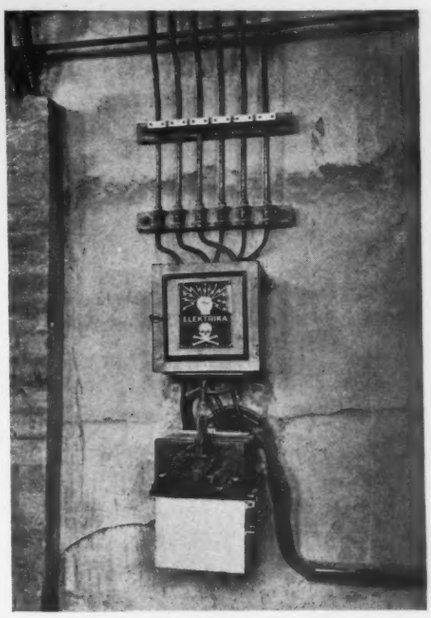


—and the result of working as shown in the picture to the left

Physical Examinations

With regard to the advisability of giving occasional physical examination to employes whose duties require them to work with the electrical lines and equipment, C. B. Auel, of the Westinghouse Electric and Manufacturing Co., who has had many years' experience with these matters, writes:

"We are having all employes who are compelled to handle live wires of any kind, regardless of voltage, undergo physical examinations at least every twelve months; for in times past we have had one or two fatal terminations in cases of electric shock of such low voltage that had the employes been



Switch provided with locking device and "Elektrika" danger sign, showing concrete conduit for heavy voltage cables at left

even in fair physical shape we cannot help but feel that they would have responded to our efforts of resuscitation."

The writer is inclined to agree with Mr. Auel's contention. Many of us have seen fatal accidents with voltages so low (even as low as 110 volts) that some physical defect in the victim must have been at least a contributing cause of the fatality.

Education Best Remedy

In the foregoing discussion we have not differentiated between low voltage and high voltages, because our accidents cover both fields and the great underlying causes seem to be the same in almost all cases. It seems almost an unexplainable fact that familiarity with live lines and apparatus breeds contempt for the dangers hidden within the silent metal. If this is the case, we can meet the situation only by conducting a ceaseless campaign of education, bringing every electrical accident to the attention of our men.

I like the suggestion implied in a recent letter from R. Frame of the Alpha Portland

Cement Co. about making the electrical foreman somewhat responsible for educational work of this kind. Mr. Frame wrote, in part:

"The electric foreman is always a member of the plant safety committee, and from him the other foremen are kept in touch with the electrical hazards and the general practice about the plant.

"At one of our meetings, I recall the electric foreman calling attention to certain motors on which blown-out fuses had been replaced by those of higher resistance. He made it very plain that this was a dangerous

Danger sign placed on motor-starting switch during repairs

practice, certain to create all kinds of trouble, and he would gauarantee that if they would call upon the electricians they would attend to all fuse replacements promptly and do the job in the one desirable way—the safe way. Since this foreman so put himself on record, you can well imagine what the gang will say to him upon his failure to make good."

Fatal Accidents Due to Electrical Causes

The following accidents which actually occurred during the past year in the cement industry illustrate the need for action along lines suggested in the accompanying paper by R. J. Hawn. Date and location of these accidents are not given, but the lessons to be drawn from them are applicable throughout the industry.—Editor.

A quarry drill helper was moving an electric well drill, dragging stem to the rear. The electric cable caught in the drill stem, tearing off the insulation. Victim was electrocuted when he grabbed the stem.

Electrician in power substation was electrocuted by coming into contact with 13,000-volt line, point and manner of contact being unknown.

Operator had right hand on switch lever to start dryer when he rested left hand on guard rail. The 440-volt alternating current which he received resulted in a fatal shock.

Electrician watched defective climber as he went up pole to hand transformer. He kept on going until he made contact with 2300-volt line and was fatally shocked.

Coal miller touched power cable, depending on insulation. Latter had become wet with rain. Ground under foot was also wet. He was killed by shock from 2200-volt line.

Electrician was opening circuit on main switchboard and after pulling two disconnects drew an arc on the third disconnect which caused fatal burns to neck, face, back of head, forearms, and hips.

South African Asbestos Industry

THE largest producer of South African asbestos is the Rhodesian Asbestos Corporation, Ltd., and its principal property is the Shabanie mine, which covers a surface area of about 2500 acres. In one section of the property known as Shabanie Block No. 170 the average grade of the ore is very rich, probably the richest in the world. Owing to the demand for asbestos in the overseas markets greatly exceeding the supply, steps are being taken on this property and others belonging to the corporation to ensure a more rapid rate of development, additional plant being erected with a view to increased production. A railway is also being constructed to the mines about 63 miles long from Somabula on the main line near Gwelo, and it is expected that the line will be completed towards the end of February or early March, 1928. This will give increased facilities for the transport of fibre to the coast, and should at the same time open up a promising new district. Other important asbestos mines owned by the corporation are Gath's and King, situated in the Victoria district, both of which gave a good account of themselves during the past year. The company was formed in 1917 to take over the Charterland and General Exploration, the asbestos claims owned by that company in Southern Rhodesia, as well as the property of the Victoria (Rhodesia) Asbestos, Ltd. It acquired the undertaking of the Rhodesian King Asbestos Co. in 1924, and shortly afterwards the Birthday mine was taken over from the Willoughby's Consolidated. The property now consists of about 2200 mining claims. The capital was increased during the early part of 1926 from £630,000 to £1,000,000 for the purpose of issuing 105,000 shares at par, capitalizing part of the reserve and issuing a bonus of one in three to the shareholders. The accounts for the financial year ended March 31, 1926, showed a net profit (after allocating £10,688 for depreciation) of £223,241, out of which dividends totaling 20% were paid. A gas producer plant was erected last year at the Shabanie property in four units of 325 hp. each, and further large additions to the plant are being made. The big drawback has been the distance from the railway of the Shabanie property, which has involved the use of about 400 wagons and some 7000 oxen. This will be overcome by the Somabula-Shabanie railway mentioned above. On the Gaths property a large amount of development is taking place, and the property has the most up-to-date mill in South Africa. The King Mine, which is equipped on a much smaller scale, is giving satisfactory returns. The power plant at Gaths is being increased, and other additions have also been made. Production last year was at the rate of about 26,000 tons, and this should be increased when all the new plant is working to about 35,000 tons per annum.

African Asbestos Company

A large producer of asbestos in the Transvaal and Rhodesia is the African Asbestos Mining Co., Ltd., which has mines in the Shabani, Belingwe, Filabusi and Mashaba districts of Rhodesia. Its largest mine at present is the Nil Desperandum at Shabani, where the management is gradually doing away with quarrying and resorting to underground mining methods in the form of shrinkage stoping adopted to suit local conditions. This does away with all cobbing in the quarries, and additions and alterations are now made to meet the new conditions. All rock is being brought to the plant and passed over sorting belts, from which fibre-bearing rock will be picked under careful supervision and conveyed to long sheds to be hand cobbed. The rock carrying fibre which is too poor for hand cobbing is returned by a series of belts to the crushers, and thence to the mill rock plant, the waste conveyed to the waste bin direct and trammed to dump, and the cobs conveyed to the plant which treats this material. This prevents a considerable amount of the shattering of fibre under the old conditions, and also effects a large saving in the labor at present employed on cobbing. A very long life is assured this mine, whose output for 1927 should be approximately 700 tons of asbestos fibre per month.

The only other asbestos mines producing worth mention are the Pagani (J. S. Hancock), which produces about 20-25 tons per month, and the Ethel (Union and Rhodesian Trust, Ltd.), which produces about 40 tons per month. It is possible, however, that Rhodesian Asbestos and Chrome Syndicate, Ltd., which has Wynne's Asbestos mine, 323 claims, in the Bulawayo district, and the Boss mine, 180 claims, in the Victoria district, will become a substantial producer later on.

New Developments in Cement Manufacture

Some Minor Problems with Which the Industry Is Confronted

By Edmund Shaw
Editor, Rock Products

AN editorial inspection trip just finished has covered a good part of the country, including the larger cities of the Atlantic coast. So far as conditions in the rock products industry are concerned, it appears that conditions of the latter half of 1927 are being continued in most places without much change. West of the Mississippi and southwest they are decidedly better and in certain cities like Boston they appear to be better. But taking the territory covered as a whole conditions promise to be about as they have been, at least for the first part of the building season.

What was of more interest to the present writer was the development in certain industries, especially in the cement industry. In the course of the trip I talked with an unusual number of cement chemists and research men, and gained some idea of what is going on in laboratories and plants. Naturally much of this cannot be published, as it has not advanced to the stage where it should be given to the public, but there are certain curious and interesting things that seem worth recording in an informal way.

For example, one would not have believed that the passage of the Volstead act could have had more than an indirect influence on the cement industry. But several chemists are finding its restrictions a difficulty. As one of them said: "I can buy poisonous booze in any peanut stand around here, but when I want to get enough, real honest-to-God alcohol for a reagent I have to go through so much red tape and worry that I am tempted to turn bootlegger myself."

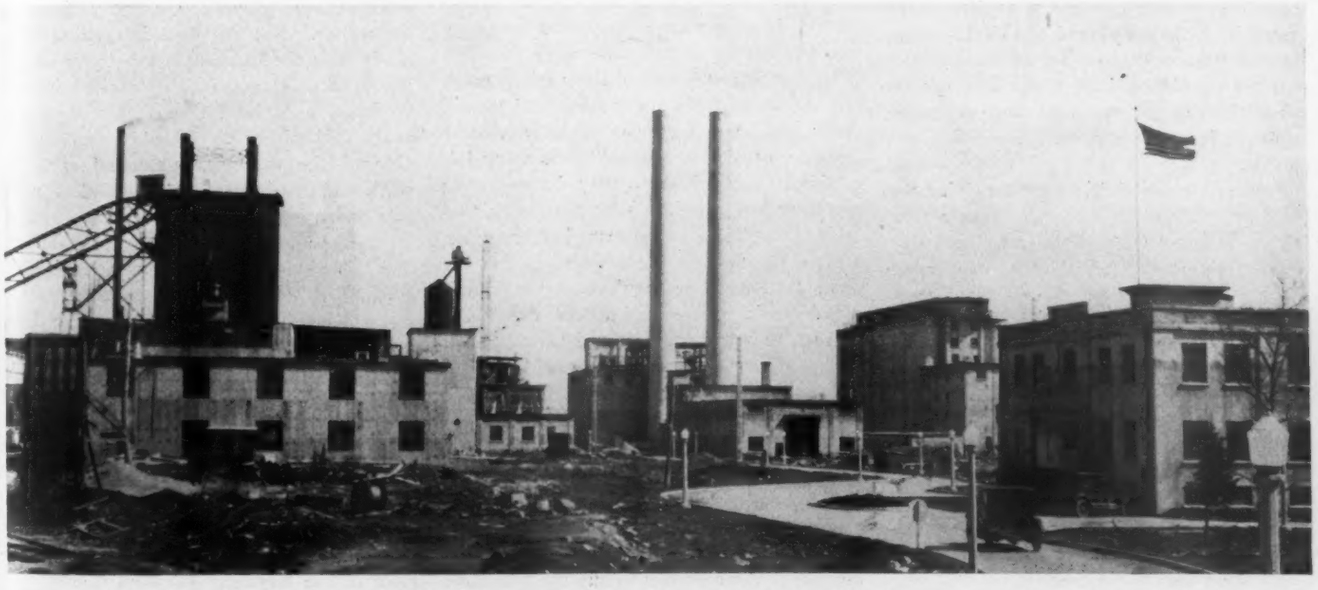
The need for alcohol as a reagent in somewhat larger quantities than usual has come from the recent interest in the determination of free lime in cement. The method, I am told, is to dissolve out the free lime with alcohol and glycerol, and then to titrate with a solution of ammonium acetate. The reagents used must be quite free from water, as any water would start the hydration of the cement and the first effect of hydration is the liberation of lime. Hence the need for pure alcohol.

Why Free Lime Determination Is Important

The free lime determination is reported to have become important just recently because some contracts for good sized orders of cement have been given with the requirement that the free lime should not exceed 0.25%. I heard about this from cement chemists in the south, at the American Concrete Institute in Philadelphia, during a brief visit to the Lehigh Valley and in New York. It is no new thing to determine free lime, of course, but if it has to be determined so closely that the chemist can say that 0.24% and not 0.25% is present, it is evident that the work must be very carefully done and the reagents must be above suspicion.

One well-known chemist gave as his opinion that few if any cements actually have so low a free lime content as 0.25%. He has analyzed samples from many plants and found the usual free lime content to be around 0.9% and they were perfectly satisfactory portland cements. More than that, he said, it was his own opinion that the effort to secure so low a free lime content as 0.25% would be time wasted. It would seem that the cement manufacturer had troubles enough at the present time with the demands for early high strength, greater plasticity and what not, without having to take on another and rather difficult requirement.

Regarding early high strength I was given a new slant on its importance by a man who has done much research work in concrete. He approves of early high strength, not so much because it enables the contractor to



The recently built plant of the Lawrence Portland Cement Co., Thomaston, Me., a fine example of the use of concrete in industrial buildings

complete his work in less time as that it provides a factor of safety where the cement is not given a fair show. As he explained it, all the ills that come to concrete come in the first part of the hardening period. It is then that the effects of improper curing and the present of slight quantities of deleterious materials in the aggregate have the most marked effect. The more rapidly the concrete passes through this period the safer it will be from the influence of such things.

A matter which has particularly interested the writer because of his general interest in the subject has been the use of air separators in grinding cement. The information received from the manufacturers of air separators (and some of them were visited on this trip) was that their use is increasing, and that not only new plants but some old plants are installing them. The reason given for their use is that greater uniformity in grinding results from their use. There is not much if any gain in the horsepower used per barrel, but there is a more definite grinding to the required stage, which is something that cannot be determined by ordinary screen tests but which shows in the physical and chemical properties of the cement. One reason given is that the circulating load of partially ground material through the mill and separator tends to iron out slight differences in the clinker.

Presumably we shall soon be studying the grinding of cements more thoroughly than we can at present, for it is understood that some of the makers of laboratory apparatus are planning to put out an air analyzer of the type originally developed by the Bureau of Standards. At present only a few are in existence, but there is no reason why they should not come into more general use, as they are not more expensive than some other testing appliances regularly used in industries. Anyone who has only seen the various sizes from 200-mesh down to 10 microns will recognize that there must be differences among them and physical and chemical analyses show this to be true.

A development which was noted at some length in the Annual Review Number of Rock Products is the use of accurate blending devices in the dry process of making cement. One of the interesting things I heard about this, during the present trip, was that the uniformity of the blended material is having an unexpected influence on the manufacturing process. It has been found that the kiln output may be increased as much as 10%, due to the uniformity of feeding made possible by a strictly uniform mixed raw material.

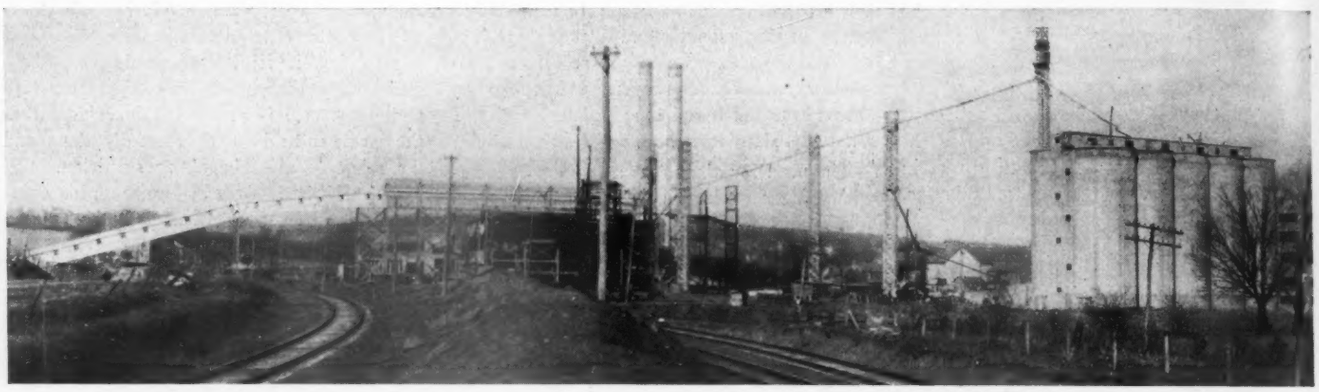
Dust collecting is another matter that greatly interests cement manufacturers and installations are being made all over the country. I called on one of the manufacturers of dust collectors just recently and found shipments just being made to three plants and work starting on orders from others. Cement manufacturers asked almost at once what Rock Products knew of the later developments in dust collecting. One of the larger plants in the Lehigh Valley has just installed a large dust collecting system separately housed on its raw grind side and another will do the same thing.

What to Do With th Dust

With improvement in dust collection comes the problem of what to do with the dust. Kiln dust is being returned in various ways, but not all of them are proving satisfactory and experiments are being made with other than the usual methods. What is wanted is a simple way of thoroughly incorporating the dust from the kiln with the slurry that is being fed. It looks easy, but there are various difficulties, one of which is that the dust, at least in some plants, tends to agglomerate in balls which do not wet easily. In fact, cement dusts are hard to wet, which explains some failures that have been had with sprays and air washing devices.

The dust from raw mills and dryers, where the dry process is used, has presented something of a problem. In two of the Lehigh Valley plants the dust collected is considerably lower in lime than the rock, in one case so much lower that it is questionable if it would pay to buy the limestone required to bring it up to the cement requirement. The fine dust from the kilns has also been found low in lime in at least one instance, and this was accounted for in part by the presence of the fine ash from the powdered coal used as fuel.

But of all the developments in the cement industry that have been noted in these trips it seems to the writer that the most important development is in the plant as a whole. The newer plants, as readers of Rock Products know, since they have been described almost as fast as they have been built, are splendid examples of industrial architecture and engineering. The plant layout has been simplified greatly over older designs. Present day plants usually set the plant units in parallel lines and transport the material at right angles to them. Since the buildings are long , this gives the shortest path.



Construction picture of the Keystone Portland Cement Co.'s plant, the newest in the Lehigh Valley

Construction is more substantial than ever and the effort is made to use concrete as much as possible. The modern cement plant is an excellent example of concrete applied to the highest class of industrial building.

What is just been said is well illustrated by the plant of the Lawrence Portland Cement Co. at Thomaston, Maine, the latest plant to begin production, recently visited by the writer. Not the least interesting thing about it is the unusual length to which the use of slip forms has been carried in construction, even such complicated structures as the coal mill being erected by this method. One of the engineers connected with the work said that he expected to see office buildings and apartment houses regularly put up by the use of slip forms, and he thought that this would come about when the present building of large industrial plants slackened and engineering and contracting companies had to look to other fields. It is possible to pour an apartment house or office building with floors, walls and ceilings all complete, with door and window frames in place, in days instead of the weeks that would be required by some other methods. If his prophesy comes true it will mean a still wider market for cement and aggregate.

Driving through the Lehigh Valley, the plant of the Keystone Portland Cement Co. was passed and the photograph shows it as it looked about six weeks ago.

Mineral Industries of the Lehigh Valley Hold a Conference

Session at Easton, Penn., Well Attended by Engineers, Architects and Builders

ANOTHER step forward in the process of familiarizing consumers with the production of the materials which they use was accomplished by the Lehigh Valley Mineral Industries conference held at Easton, Penn., on April 25, 26 and 27. The purpose of the conference was primarily to stimulate an interest in the products of the Lehigh Valley and to show engineers, architects, builders and other interested persons the vast resources of the valley, as well as to demonstrate advantageous methods of using these products. It is doubtful if there is any region in the country whose mineral resources rank with those of this eastern Pennsylvania valley, and it is certain that it would be difficult to find a place with such varied products. This is easily seen from a glance at the program of the conference, which details the three days of the meeting, each of which was devoted to a single phase of the valley's natural wealth. The first day was taken up entirely by the cement industry, the second was devoted to slate and the third day was given over to iron and steel production.

A. S. T. M. State Committee Meets

More than 20 organizations and companies joined together in putting on the conference. The sessions were held at the Hotel Easton and in Pardee Hall at Lafayette College. Prof. W. B. Plank, head of the department of mining engineering at Lafayette, was general chairman of the conference. In fact, much of the success of the conference was due to the co-operation of the faculty at Lafayette College together with the assistance of the faculty of Lehigh University.

Although April 25 was the cement day of the conference, the morning was occupied with a meeting of the A. S. T. M. Committee D-16 on slate. Committee reports were presented, and were followed by a considerable discussion of methods which should be used in procuring samples of slate for testing. It was felt that in many of the tests at present being conducted (particularly by the government) there was unfairness in the getting of samples. Thus a producer who was shipping slate for sills, for example, would send a different piece than if he were producing for blackboards or other interior pieces, yet in the testing going on at present there has been little or no attempt to differentiate the various kinds of slate according to the use which the producer sells them for. In his paper on "Testing of Slate" delivered before the committee, Assistant Professor C. W. Macdougall of Lafayette urged the necessity of some standard method of procuring samples as well as testing. He recommended that whenever tests are to be made, the purpose of the test be stated, and the sample be chosen accordingly. He also recommended the use of tests of transverse strength.

In the afternoon a complete inspection of the Alpha Portland Cement Co. plant No. 4 at Martin's Creek was made. The opportunity was thus provided to see the actual manufacture of one of the leading products of the Lehigh Valley. It is stated that almost one-third of all the cement produced in the United States comes from this region. While the trip through a cement plant was an old story to some, there were many others to whom it was a new, and valuable, experience. Since this plant is one of the large producers in the region, it was an excellent one for the inspection.

A dinner was provided to the members of the conference on the evening of the first day by the Alpha Portland Cement Co. Following the dinner, Louis Anderson, Jr., chemical engineer for the Alpha company, presented a paper on "The History and Manufacture of Portland Cement," which was followed by three reels of motion pictures prepared by that company entitled "Cementing the Centuries," in which a thorough review of the manufacture of cement was shown.

Aggregate for Concrete

W. G. Bragg, service engineer of the Alpha Portland, gave a paper on "The Modern Methods of Designing Portland Cement Concrete," which outlined the following four requirements of good concrete: correct ratio of aggregates, right quantity of mixing water, thorough mixing and correct curing. In regard to aggregates, Mr. Bragg said: "I think we can all agree that concrete materials must have certain general properties such as cleanliness and durability. For the purpose of this discussion we will start with: 'hard durable particles, practically free of injurious foreign substances and evenly graded from the largest to the smallest sizes.' Now of course there is an ideal gradation of particles, but there is an ever-increasing tendency toward making the specifications fit quarry practice rather than some theoretically perfect grading. Let us say then that the coarse aggregate is crusher run material containing all the product of

Pardee Hall, Lafayette College, where the sessions were held

Exhibit of how slate can be used on roofs of industrial plants

the crusher from the largest size specified down to but not including particles which will pass a ¼-in. screen. The largest size particle will be determined by the character of the structure and the smallest space to be filled with concrete. The fine aggregate will be a fairly well graded sand all of which pass the ¼-in. screen with at least 95% retained on a 100-mesh sieve. The cement of course must meet the requirements of American standards.

"Regardless of the method of proportioning, too much emphasis cannot be placed upon the importance of accurate measuring devices and upon certain inherent properties of the materials. We strongly urge the use of weight measurements wherever possible and when volume measurement is employed some correction must be made for the bulking effect of moisture in the fine aggregate. For example, sands containing only 3 to 5% of moisture will bulk in volume from 10 to 30%. Many of the sands used in this vicinity bulk 25% under normal use conditions. Using such sands with no allowance for bulking, a specified 1:2:4 proportion becomes a 1:1½:4 mixture; an undersanded, unbalanced mass containing a 10% excess of cement. In practice, this mixture, containing more than the specified amount of cement will be deficient in strength because an undersanded mixture is harsh and lacks the property of workability. Mixer operators all have the same cure for this lack of workability. They add more water to the mix, causing segregation of the aggregates with all the accompanying evils. Under these conditions the production of a porous structure having less than normal strength is inevitable. In general, due to the use of arbitrary proportioning and volume measurements of the aggregates, there has been a decided tendency to undersand all concrete mixtures and it is my opinion that more troubles have been experienced with concretes because of undersanding than for any other reason or group of reasons. I say then that a specification which does not permit an adjustment of the fine to coarse aggregate ratio and which does not in some way recognize the bulking of damp sand, defeats the purpose for which it was intended: the production of the best possible concrete with the materials available. In the use of the water-cement ratio specifications it is, of course, necessary to consider the free water in the aggregates as a part of the specified quantity. It is not uncommon to find that the sand as used contains a half gallon of free water per cubic foot of sand."

Slate Session

On the morning of April 26, a technical session was held at Pardee Hall with W. L. Cumings, geologist for the Bethlehem Steel Co., presiding. Dr. George H. Ashley, state geologist for Pennsylvania, presented a paper on "The Mineral Resources of Eastern Pennsylvania," which was fully illustrated by pictures on the screen. Professor Charles H. Behre, Jr., in his talk on "The Geology of Slate," presented several excellent points on the necessities of the slate industry today. He said that at present there are actually too many slate quarries and that to meet this situation it was absolutely essential that any quarry that is abandoned for any cause should stay closed and not start in business again. Another decided necessity, he said, was that the industry must seriously look to its cost accounting, as

Sample slate roof set up at the conference

only through accurate cost data could success be reasonably assured. Speaking of the production side, he called attention to the use of the wire saw as the means for cutting down producing costs and providing a better product.

Use of the Wire Saw

Dr. Oliver Bowles, superintendent of the United States Bureau of Mines Experiment Station, New Brunswick, N. J., spoke on "The Wire Saw in Slate Quarrying." He said that the technology of the industry must be improved just as surely as the geology of the industry must be studied. He traced the technology of the quarry from the advent of the old channeling machine to the coming of the new wire saw. He pointed out that the channeling machine cuts by pounding, thus fracturing the slate around the cut, whereas the wire saw uses abrasives in cutting and cannot fracture the surrounding slate. At the same time the channeling machine must make a wide cut, while the wire saw cut is less than ⅜ of an inch in width. A good channeler could cut an area of 50 to 60 sq. ft. in a day, and the wire saw can cut anywhere from 12½ sq. ft. to 38 sq. ft. in a single hour. Dr. Bowles also declared that there was not any appreciable difference in cost in the two kinds of equipment. The saw can be set to any angle to cut across the layers so that no waste is derived from this source. And since the saw can easily run both day and night shifts, and can be handled by one man instead of two, as are required by the channeling machine, Dr. Bowles felt that the cost of production using the wire saw was reduced from ½ to ¼. Dr. Bowles also noted that this equipment might profitably be used in other quarry work besides in the slate industry. In the latter industry it has become almost immediately popular, since it was introduced into this country scarcely a year ago from Belgium, and already it is in use in a majority of the slate quarries in the Lehigh valley.

A paper on "The Architectural Uses of Slate" was presented by Donald Kirkpatrick, an architect of Philadelphia. He called attention to the essential tests he puts to a building material before using it, which include whether the material is a real natural product or is manufactured, whether it will become obsolete, has become obsolete, or will probably never be obsolete; and whether it is subject to competition from initiative materials which will detract from its value. Mr. Kirkpatrick felt that slate successfully met all these requirements.

Markle Mine Building Started

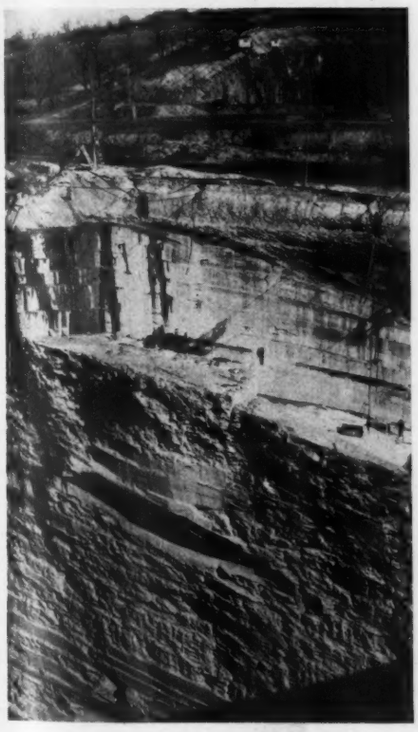
Following the morning session, the delegates to the conference and the entire student body of Lafayette College assembled on the campus to witness the ground breaking ceremony for the new John Markle Mining building. John Markle, a graduate of Lafayette in the class of 1880, is the donor of the building and he was present to turn the first shovelful of earth. Scott Turner, director of the U. S. Bureau of Mines at Washington, addressed the gathering.

At Pardee Hall, various slate companies had comprehensive displays of their products on exhibit. The Structural Slate Co. of Pen Argyl had a full display of slates finished in various colors for use in interior work, especially for such uses as bathrooms and similar installation. These included slates finished in exact reproduction of marble slabs and of polished wood, as well as many different shades in plain colors. This exhibit was without doubt a revelation in what uses can be made of slate when carefully finished. The other most interesting exhibit was shown by the Chapman Slate Co. of Bethlehem. This was made up of a full section of roof, shingled with slate shingles as shown in the illustration. One side of the roof was finished with the usual thin shingles, but the other side demonstrated the fine architectural effect obtained by using shingles about ½-in. thickness with

somewhat rough edges. The other exhibit of the Chapman company showed a section of a roof for industrial purpose where there is little slope desired. Here large slopes about 1-in. in thickness are used, and they are milled at either end to insure correct laying on the roof.

Visit to Slate Quarries

An inspection trip of the slate quarries at Pen Argyl was provided for the afternoon of April 26, but first the slate producers presented the delegates to the conference with an exceptional luncheon at Ross Common Manor, at Wind Gap, near Pen Argyl. Inspection was first made of the factory of the Structural Slate Co. where the slate is finished for use in bathroom tile, etc., as noted above. This company is jointly owned by the producers of the locality and does not quarry its own slate, but receives it from the quarry companies, and finishes it for market. Here the conference was shown how an impression on a copper plate is transferred to the slate and leaves the permanent finish on the slate. The



Parsons Bros. quarry, showing a new cut (at top) made with wire saw

copper plate used in this case was etched in exact reproduction from a slab of polished marble, and hence the finish on the slate has exactly the markings of the marble. Any number of different colors could be used on the slate slabs. Similar other types of finishes are here applied to the pieces of slate, and this factory, without doubt, was a revelation to architects and builders who could easily avail themselves of this product.

The Colonial Slate Co. quarry and also the quarry of Parsons Bros. Slate Co. were visited. At the latter the delegates had the opportunity to descend nearly 500 ft. to the bottom of the pit and study the use of the wire saw at close range, and note the ease with which it performs under varied circumstances. The mill of the Parsons Bros. plant was also fully inspected by the delegates.

In talking to producers of slate in the Lehigh Valley district, one is quick to note the emphasis that is now being placed on the merchandising of the product. It is doubtful if the industry has ever done so much advertising as it is doing at the present moment, and it seems apparent that this advertising will bear fruit eventually. Cost accounting systems are also being discussed in the industry and more attention is being paid to the cost of production as well as to the amount of production. As for the quantity of production, it is evident that the wire saw has come to stay, and is brought with it increased production and a better product.

Engineer Citizens

The conference dinner was held on the evening of the 26th, with R. S. Gerstell, president of the Vendor Slate Co., as chairman. Dr. George Otis Smith, director of the U. S. Geological Survey, and president of the American Institute of Mining and Metallurgical Engineers, chose as the subject for his talk at the dinner "Engineer-Citizens." He spoke of the prevalent feeling that the all-important factors in this country are represented by Wall street and the capital at Washington, whereas he declared that the mineral resources of the country and the constructive thinking of the citizens were the vital factors. Dr. Smith says: "The present situation in the industrial and business world is a complex of interesting causes and reacting effects not easily itemized and entered on our trial balance sheet. But chief among the liabilities of today is the excess of production capacity in most branches of industry. The farmer has no monopoly in his desire for relief. Too much efficiency is the explanation I would offer and as efficiency and engineering are almost synonymous terms, the indictment of responsibility would seem to lie against the engineer. He has simply done his work too well. In these days that long-revered law of demand and supply has to endure much at the hands of engineers. A greatly desired balance of production and consumption is defeated at every turn by efficiency. All this is an inevitable consequence of modern industry interferring with an ancient law in economics, and to me the lesson is obvious; engineers need to give more attention to economics. You engineers know the facts better than the economists, and you are less hampered by acquaintance with economic theory—why are you not best fitted to tackle such business problems as the control of production and find the solution in terms of conditions existing in 1928?

"The compelling argument for the enlistment of engineers as citizens is the plain every-day fact that politics has not kept pace with science. All of us can aspire to be useful private citizens, each taking such an interest in public affairs that in the aggregate the political contribution by engineer-citizens will become a constructive and conserving power throughout the land. We

Slate quarry showing how wire saw works with the slope of the strata

engineers will do well to develop that kind of class consciousness."

The conference undoubtedly will mean much to the industries of the valley, and especially to the slate industry. Practically all of the slate producers and slate organizations in the district joined in making it a success. The National Slate Association lent its full support to the project, and the association secretary, W. S. Hays of Philadelphia, acted as treasurer for the conference. D. Knickerbocker Boyd of the Structural Service Bureau, Philadelphia, was the conference secretary, and H. M. VanCleave, the secretary of the Bangor Slate Association, Bangor, Penn., was in charge of registration arrangements.

Certain-Teed Products Acquires Colorado Gypsum Deposits

THE Turkey Creek gypsum deposit, located in the northwestern part of Pueblo county, Colorado, which was sold by the American Cement Plaster Co. to the Beaver Products Co., has been purchased by the Certain-Teed Products Corp., and it is understood that the new owners will utilize the plant for supplying gypsum to its various plants located in the southwestern part of the United States.

Hints and Helps for Superintendents

Method of Returning Dust to Cement Kilns

ONE of the problems connected with the collection of dust in cement plants is that of disposing of the dust. The dust collected from the kilns by chambers, and in some instances by more elaborate systems of dust collection, is only partially burned and in many cases it has a different chemical composition from the slurry. If it can be thoroughly mixed with the slurry its effect is not noticed, but if it is fed by itself it makes an unsatisfactory clinker.

Several methods of returning dust have been tried, some giving good results and others results that are not so good. Of all that have been noted the method worked out by the Lawrence Portland Cement Co. and applied at its new plant in Thomaston, Maine, is about as logical and as simple as any.

The dust is collected in chambers of usual design and sent by a screw conveyor to the suction of a 2-in. centrifugal pump. Water is added here in just sufficient amount so that the mixture may be pumped and it is sent to a hopper which stands near the slurry feeder above the kilns. Pumping does not give quite enough agitation to mix the dust and water to a uniform slurry, but this is accomplished by a mixer and screw feeder at the bottom of the hopper. From the feeder the mixture goes into a mixing pot attached to a chamber connected to the slurry feeder, and in this way it finds its way to the kilns and the return overflow which completes the circulation between the kiln feeder and the slurry feed tank.

One picture shows the hopper with the pipe entering at the top; the other gives the screw feeder and mixing pot in detail with the slurry feeder at the back.

Bottom of the hopper showing screw conveyor and mixing pot where the dust is made into slurry before being returned to kiln

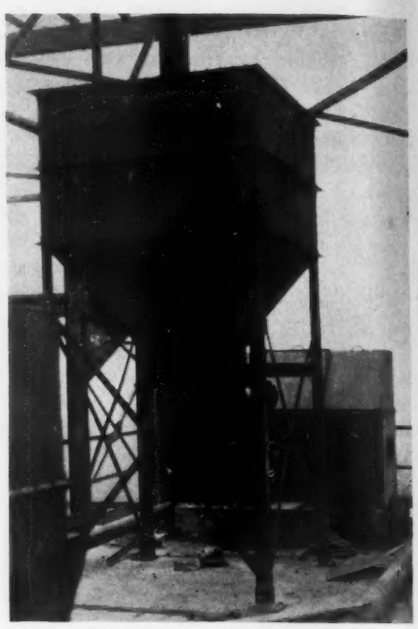
Repairing Leaks in Water Jackets and Pumps

By W. L. HOME
Pine Plains, New York

WINTER brings the usual quota of cracked water jackets and pumps, and where quick repairs are needed the ideas below will be of assistance.

For water jackets and centrifugal pumps use a soft patch of lead or copper. If the crack is in a casting of quite irregular shape and not much pressure, lead is probably best to use, and if the crack is easily accessible, somewhat regular and with little pressure, perhaps copper would be best.

First locate the extremities of the crack and clean all around it thoroughly. Cut a thin sheet of lead or copper sufficiently large to cover about an inch all around the crack. Hammer this piece of metal over the crack until it exactly conforms to the surface of casting. After this, spot the location for a sufficient number of studs to hold the patch in place. Drill the holes and tap them out the right size for the studs. This part of the work is entirely up to the judgment of whoever is doing the job. After the stud holes are tapped out give the surface a generous dose of thick white lead, put the patch in place, and when the studs are tight you will have a neat job that will not leak and will last a long time. A patch of this kind is good on all types of equipment from an automobile to a centrifugal pump.

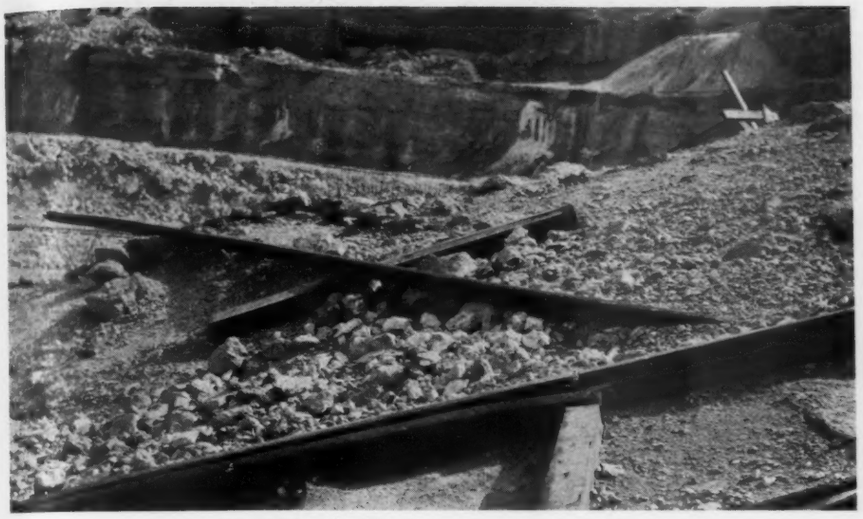


Kiln feeder and hopper to which the dust is pumped after mixing with water

Leaks from small cracks where it is possible to get at the inside of the casting and where corrosion is no objection can be stopped by using sal ammoniac as a corrosive agent. Simply mix up a strong solution of sal ammoniac and fill the casting with the solution until the crack is submerged. Allow this to stand over night and the leak will seal itself.

Rail Lengths Used to Prevent Washing Away of Quarry Ramps

A SIMPLE method of holding the surface of a quarry ramp, or similar incline, is shown in the accompanying view. A discarded piece of light quarry-track rail is placed on the slope, with the end away from the tracks lower down the slope than the other end. The rail should be 15 or 20 ft. in length and should be imbedded slightly in the surface of the slope. Surface material washed down upon the rail will soon fix it



Rail length imbedded in quarry ramp to prevent washing

firmly in position, and thereafter it will hold the surface securely, carrying the drainage water away from the tracks and switches of the incline and preventing the washing away of the slope. Such rail pieces should be placed at regular intervals along the slope.

Handling Sand Hopper Gate

AT THE portable plants of the Yahola Sand and Gravel Co., Muskogee, Okla., one man attends to the loading of two cars, one of gravel for concrete aggregate, the other of pea gravel for road surfacing. There is not enough sand in this material to be saved, but the same arrangement could well be used in plants where a car of sand and a car of gravel are loaded on parallel tracks at the same time.

The man can attend to both cars, because he can control the flow from the pea gravel hopper from the gravel car. The hopper is closed with a sliding gate and this is moved by levers that extend across the plant. As he trims the carload of gravel he keeps his eye on the flow from the hopper and opens or closes the gate as the need arises.

One of the pictures shows him pulling on the lever to close the gate, the other being a close-up of the hopper bottom and gate. The hopper is a simple square pyramid 4 ft. by 4 ft., with sides sloping 45 deg. to an opening 6 in. square. The gate is a plain plate working easily in slides on the mouth of the hopper. When it is closed only a little water leaks through.

Tank for Clarifying Water

THE PICTURE shows a tank used for clarifying the waste water from the plant of the Fort Worth (Texas) Sand and Gravel Co.

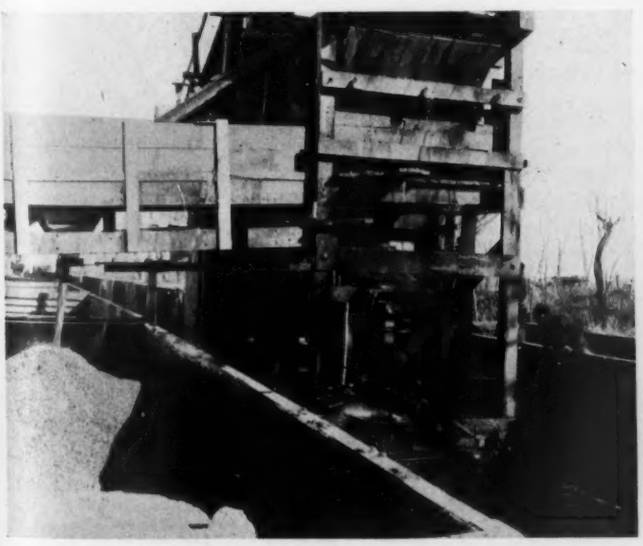
The tank is 16 ft. in diameter and 12 ft. high, and it is made of corrugated iron. This cheap and simple form of tank is much used in the Southwest wherever water has to be stored. In this case it is set exactly level so that the water runs over the edge evenly all around. The tank was in action, but the film of water running over the side was so thin and so clear that it does not show in the picture.

Tank used for clarifying waste water so that it may be used again

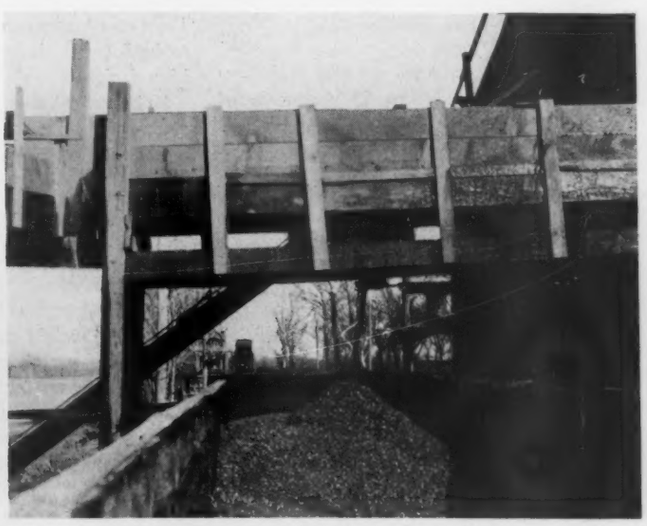
An underflow of clayey water and fine sand is taken out of the bottom of the tank through a pipe with a valve which shows at the left of the tank. This settles in a small settling pond and the overflow from this pond and the overflow from the tank are pumped back to the plant.

It is claimed that this method reduces the area of the settling pond needed and thus saves tying up valuable land. It also saves loss from evaporation, which is worth considering in the Southwestern states.

Whenever sufficient fine sand has accumulated the underflow of the tank is turned into another settling pond on the other side, which cannot be seen in the picture. The full pond is then dug out by a dragline, and it finds a ready sale for bedding cattle cars.



Man in the car at the right operating lever which enables him to control flow of sand to other car



Hopper bottom and gate which is controlled by lever from a distance

Sand-Lime Brick Production and Shipments in April

THE following data are compiled from reports received direct from 23 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is three less than those furnishing statistics for the March estimate published in the April 14 issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

It is noted that production has not increased along with the increase in shipments. Seven of the plants reported no production for the month. It is likely, however, that this condition is not entirely representative of the whole industry and that actually the production over the country would show an increase over the figures for March if the data were available. Both stocks on hand and unfilled orders remained about the same as in the March figures.

The following are average prices quoted for sand-lime brick in April:

Average Prices for April

Shipping Point	Plant Price	Delivered
Albany, Ga.	.....	.....
Atlantic City	$13.00	.....
Buffalo, N. Y.	12.25	$16.50
Columbus, Ohio	.....	15.50
Detroit, Mich. (2 plants)	.....	16.00
Detroit, Mich.	.....	15.00
Flint, Mich. (less 5%)	.....	18.00
Grand Rapids, Mich.	.....	.....
Hartford, Conn.	14.00	18.00
Jackson, Mich.	12.25	.....
Madison, Wis.	12.50	14.00
Menominee, Mich.	11.00	14.50
Michigan City, Ind.	.....	.....
Milwaukee, Wis.	10.50	13.00
Minneapolis, Minn.	10.00	12.50
Rochester, N. Y.	.....	19.75
Saginaw, Mich.	12.00	.....
Sebewaing, Mich.	.....	.....
Syracuse, N. Y.	18.00	20 00
Toronto, Canada	12.50	15.00
Winchester, Mass.	.....	16.00

The following statistics are compiled from data received direct from 23 producers of sand-lime brick in the United States and Canada:

Statistics for March and April, 1928

	*March	†April
Production	17,063,100	10,500,000
Shipment (rail)	4,272,900	4,828,700
Shipments (truck)	9,390,800	8,397,000
Stocks	16,777,200	14,590,000
Unfilled orders	16,942,000	14,123,000

*Revised to include two plants not furnishing March data previously, 26 plants reporting.

†Incomplete, one plant not reporting stocks and six plants not reporting unfilled orders.

Notes From Producers

Walker and Frank Brick Co., Detroit, Mich., is furnishing half a million brick for two solid sand-lime brick walls in the new Book Tower garage in Detroit.

The Wisconsin Brick Co. has been recently making improvements at its plant at Madison, Wis. The company is now furnishing brick for a new Masonic temple at Freeport, Ill., and for the high school at Sun Prairie, Wis.

The Winchester Brick Co., Hartford, Conn., is supplying 3,000,000 brick for the new Sears-Roebuck Co. building at Brookline avenue and Audubon road, Boston. Hegeman-Harris Co., Inc., are the contractors for the job.

Plan New Cement Plant at Cleveland

THE Great Lakes Portland Cement Co., of Buffalo, N. Y., has acquired a site in the Cuyahoga Valley near the Erie railroad and about $2,500,000 will be spent in construction of cement silos, storage warehouses and eventually a cement manufacturing plant, it is reported. The company is affiliated with Lehigh Portland Cement Co.—*Wall Street News* (New York City).

Producers and Railroads Lose Through High Rates

THE counsel for the producers, Frank A. Leffingwell, has filed his brief in the investigation of rates on sand, gravel, crushed stone, shell and related commodities being made by the Interstate Commerce Commission. The rates involved apply to shipments in Arkansas, Oklahoma, Texas and Louisiana west of the Mississippi. Producers have approved the scale proposed by the Louisiana Highway Commission, beginning at 37c and 50c at 10 miles and ending at 238c at 800 miles. The carriers have proposed a joint and single line scale beginning with 60c and 80c at 10 miles and reaching a maximum of 380c at 800 miles.

After showing that the public interest is best served by rates that "encourage the largest practicable change of products" between different sections of the country, Mr. Leffingwell gives some examples of losses to both railroads and producers through too high freight rates:

"The record shows that 43,000 tons of rip rap moved into Galveston by schooner; that a road between Round Rock, Texas, and Georgetown, Texas, was built with local material furnished by a portable crusher because it was cheaper than the price a legitimate gravel producer could make on his gravel, delivered; that San Antonio moved its crushed stone from Dittlinger, Texas, when the freight rate used to be 36c, but they now have opened a municipal crushing plant and use local material which they admit to be inferior; that 45,000 yd. in Milan county, Texas, were lost to local competition involving a truck haul of nine miles because the Buda plant could not meet the price; and that the movement from Tally, Texas, to east Texas points decreased 75% after the increase in freight rates in 1920.

* * * In 1925 the tons sold or used in Texas exceeded the tons originated by Texas railroads approximately 2,361,000 tons. A proper rate adjustment will bring much of this lost tonnage back to the railroads.—*Abstracted from National Sand and Gravel Bulletin.*

Sands for Making Plaster Mortar and Stucco

THE current *Sand and Gravel Bulletin* has an interesting article, "Sand for Use in Building Construction," which describes plaster, mortar and stucco sands. It is by Stanton Walker and C. E. Proudley, director and assistant director of the engineering and research division of the National Sand and Gravel Association.

The authors review the plaster sand specifications set up by the American Society for Testing Materials and comment on them briefly. They point out that the wide variations permitted in gypsum plaster sand would result in similar variations in the quality of the plaster. Examples of typical lime plaster sands are given.

They point out that no specification has been prepared for sand used in brick mortar and suggest that any clean concrete sand should be specified. The matter is one that might well receive attention from engineering bodies.

A discussion of stucco sands takes up nearly one-half of the paper. It is pointed out that the Bureau of Standards recommendation is too severe for application in all localities.

Ontario Changes Inspection for Gravel Operations

OWING to changes being made by the Ontario Department of Mines in its systems of inspecting sand and gravel operations which come within its jurisdiction, local or seasonal inspectors at Point Pelee, Port Maitland, on the St. Clair and Niagara rivers, at Sarnia, and in the township of Wainfleet will be required no longer. Homer Graham is to be appointed from the department to carry on their work.

Mr. Graham will be given authority to board boats commercializing in Ontario waters at any time to check up on their cargoes and their operation logs.

Sturgeon Bay Quarry Makes Improvements

THE Sturgeon Bay quarry, formerly owned by the Leatham D. Smith Stone Co., and now owned by Dolomite, Inc., of Cleveland, Ohio, has made improvements in its quarry and boat loading equipment recently. Boats will be loaded from the dock by two 60-in. belts which have a combined capacity of 3000 tons per hour.

New quarry equipment includes well drills and a 4-yd. full revolving electric shovel.

Editorial Comment

The Lime Convention

What is an industrial convention? Should it consist of a series of technical papers in a set program, or of edifying addresses and sermons on business ethics? The main purpose of an ordinary convention of manufacturers is surely educational, in a broad sense. They make men who attend broader and more liberal in their viewpoints. They give men helpful ideas on both operation and management problems. They build business acquaintance and friendship. A good convention should have an all-around good program with a little something that will interest every one.

But, in the opinion of those in charge, the coming convention of the National Lime Association, is not to be an ordinary convention, but an extraordinary one. Therefore no set program has been arranged. It is to be a free-for-all discussion of rather critical conditions that have arisen during the past two or three years. There will be an inspirational address or two by men entirely outside the lime industry, who have had experience under similar conditions, for the problems of the lime industry are far from being unique.

The success of the convention, however, rests entirely with the attitude of the lime manufacturers themselves. The occasion for an airing of grievances and for criminations and recriminations, that every one who attends is already too familiar with, is a generous one.

It is to be hoped that the brief two days will be spent more profitably in *constructive suggestions* and in *ACTION*.

We Need a Cement Tariff

It is generally recognized that an exchange of commodities between nations ought to be on the same basis as a fair trade between individuals, an exchange by which both parties profit. Where conditions were such that a foreign country has profited unduly by such exchange, it has been the unvarying policy of the United States to equalize conditions by imposing a protective tariff. The success of this policy has been so generally agreed upon that its application has been taken out of politics. It is applied by the chief executive rather as a matter of course, except in some instances where an Act of Congress is necessary.

Many of the portland cement manufacturers of the United States are now asking that this protective policy be applied to their product and are issuing statistical letters and pamphlets to prove it. They point out that foreign manufacturers have two advantages over American manufacturers which could be equalized by a protective tariff. A minor advantage is that of cheap transportation from European ports; a major advantage is the exceedingly low wage scale of European cement making countries, a scale upheld by laws which limit the demands of labor and the standard of living. Wages in Belgium, the chief cement exporting country, are shown to be about one-fourth of the wages paid in the United States.

It is shown that importations of foreign cement have increased pretty steadily since 1921, and now their effect is being severely felt by the manufacturers whose principal markets are the seaboard cities. In these markets, according to the president of one of the largest companies, American cement is now being sold at an actual loss.

There might be some argument for leaving cement unprotected under such conditions if the ultimate consumer of cement profited. But the figures gathered by interested manufacturers show pretty conclusively that the ultimate consumer does not benefit. He buys concrete in place into which other things than cement go, and investigations in certain seaboard cities have shown that the price of concrete in place has not been lowered appreciably by the use of foreign cement. Compared to the loss to the country that has come from decreased employment and decreased returns on invested capital, the gain from using foreign cement has been as nothing.

Up to a certain point American cement makers have been able to offset the advantages of cheap labor and transportation by building larger production units and employing labor saving machinery to a greater degree than it is used in European plants. But they say that the limit of such cost reduction has been reached and the alternatives before them now are the loss of important markets or a deep cut in wages. Either alternative appears calamitous. The lowering of wages in a single industry might not have a great effect but it could easily be the start for a general lowering of wages in industries affected by foreign competition. And with the whole American economic structure resting upon a high wage scale and a high standard of living, this might easily mean disaster.

It is quite fair, as one of the manufacturers says, that the American maker of cement should be compelled to make it with as few man hours as his foreign competitor, but it is not fair that he should be asked to reduce the man hours to equal the advantage of a competitor who pays only 25% of American wages. He should not be the victim of the economic situation which the American people have created by their firm adherence to a policy of protection to industry and high wages.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. com.[37]	12-30-27	3	7	
Allentown P. C. 1st 6's[37]	12- 5-27	90	92	
Alpha P. C. new com.†	5- 8-28	43	44	75c qu. Apr. 14
Alpha P. C. pfd.[2]	5- 7-28	117	.....	1¾% qu. June 15
Amer. Aggregate 6's, bonds	5- 8-28	106	106	
Am. L. & S. 1st 7's[32]	2-24-28	101¾	102½	
Arundel Corp. new com.	5- 8-28	51	51¾	50c qu. Apr. 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	5- 9-28	108	112	
Atlas P. C. com.[3]	5- 7-28	43	45	50c qu. Mar. 1
Atlas P. C. pfd.	5- 7-28	43	.....	66⅔c qu. Apr. 2
Beaver P. C. 1st 7's	7- 9-27	100	100	
Bessemer L. & C. Class A[4]	5- 4-28	36	37	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	5- 4-28	101	101½	
Boston S. & G. com.[16]	5- 5-28	82	.....	$1 qu., $1 x. Jan. 2
Boston S. & G. 7% pfd.[16]	5- 5-28	85	.....	1¾% qu. Jan. 1
Boston S. & G. 1st pfd.[16]	5- 5-28	90	.....	2% qu. Jan. 1
Canada Cement com.	5- 8-28	35	35½	
Canada Cement pfd.[43]	5- 4-28	99¾	100	1.62½ qu. Mar. 31
Canada Cement 5½'s[43]	5- 4-28	102	103	
Canada Cr. St. Corp. 1st 6's[11]	4-21-28	96	99	
Certainteed Prod.	5- 7-28	60	60½	$1 qu. Apr. 1
Chas. Warner com.[16]	5- 8-28	34	36	50c qu. April 10
Chas. Warner pfd.[16]	5- 8-28	108	.....	1¾% qu. Jan. 26
Cleveland Stone new st'k.	5- 8-28	74¼	77	50c qu. June 1
Consol. Cement 1st 6½'s, A[42]	5- 9-28	92	.....	
Consol. Cement 6½ notes[24]	5- 9-28	94	98	
Consol. Cement pfd.[41]	5- 9-28	.....	50	
Consumers Rock & Gravel 1st 7's[18]	5- 4-28	99½	102	
Coosa P. C. 1st 6's[35]	12-28-27	65	75	
Coplay Cem. Mfg. 1st 6's[40]	5- 7-28	90	.....	
Coplay Cem. Com.[40]	5- 7-28	12½	.....	
Coplay Cem. pfd.[40]	5- 7-28	72½	.....	
Dewey P. C. 1st 6's[30]	5- 9-28	99	101	
Dolese & Shepard[7]	5- 9-28	160	165	$2 Apr. 1, $1.50 ex. Apr. 1
Edison P. C. com.[39]	5- 5-28	50c	.....	
Edison P. C. pfd.[39]	5- 5-28	1	.....	
Edison P. C. bonds[39]	5- 5-28	75	.....	
Fredonia P. C. 1st 6½'s[32]	12-28-27	97	101	
Giant P. C. com.[25]	5- 7-28	30	35	
Giant P. C. pfd.[25]	5- 7-28	38	40	3½% Dec. 15
Ideal Cement com.	5- 8-28	115	125	$1 qu. Apr. 2
Ideal Cement pfd.[33]	5- 5-28	110½	111½	$1.75 qu. Apr. 2
Indiana Limestone 6's	5- 8-28	98	98¼	
International Cem. com.	5- 8-28	73¼	73½	$1 qu. Mar. 30
International Cem. pfd.*	5- 8-28	110½	111	1¾% qu. Mar. 30
International Cem. rts.	5- 8-28	5/8	7/8	
International Cem bonds 5's	5- 8-28	99¼	99⅜	
Kelley Is. L. & T. new st'k.	5- 8-28	50	53	62½c qu. Apr. 2
Lawrence P. C.[3]	5- 7-28	108	112	2% qu.
Lehigh P. C.	5- 7-28	52	55	62½c qu. Jan. 1
Lehigh P. C. pfd.	5- 7-28	110	.....	1¾% qu. Apr. 2
Lyman-Richey S. &. G. 1st 6's, 1931[13]	8-12-27	99½	100	
Lyman Richey S. & G. 1st 6's, 1935[13]	8-12-27	97½	99	
Marblehead Lime 1st 7's[14]	5- 5-28	100	.....	
Marbleh'd Lime 5½'s, notes[14]	5- 5-28	98½	100	
Mich. L. & C. com.	5- 7-28	35	.....	
Mich. L. & C. pfd.[9]	4-21-28	24	27	1¾% qu. July 15
Missouri P. C.	5- 8-28	50½	51	50c qu. May 1
Monolith P. C. com.[9]	5- 3-28	15½	16	8% ann. Jan. 2
Monolith P. C. pfd.[9]	5- 3-28	9½	10	
Monolith P. C. units[9]	5- 3-28	34½	36	
National Cement 1st 7's[38]	5- 4-28	96	99	
National Gypsum A com.[35]	5- 9- 28	28	30	
National Gypsum pfd.[35]	5- 9-28	64	67	1¾% qu. Apr. 1
Nazareth Cem.[26]	5- 4-28	31½	33	75c qu. Apr. 1
Newaygo P. C.[1]	12-30-27	115	.....	
Newaygo P. C. 1st 6½'s[23]	2-11-28	120	.....	
New Eng. Lime pfd., A[14]	4-20-28	.....	95	
New Eng. Lime pfd., B[22]	5- 4-28	97	99	
New Eng. Lime com.[22]	5- 4-28	32	36	
New Eng. Lime 1st 6's[14]	5- 5-28	98	100	
N. Y. Trap Rock 1st 6's	5- 8-28	102¾	103	
North Amer. Cem. 1st 6½'s	5- 8-28	90½	91	
North Amer. Cem. units[19]	5- 7-28	45	55	2 mo. per. at 7%
North Amer. Cem. com.[19]	5- 7-28	8	11	
North Amer. Cem. pfd.[19]	5- 7-28	40	45	$1.75 qu. Aug. 1
North Shore Mat. 1st 5's[15]	5- 9-28	99½	.....	
Northwestern States P. C.[37]	11-21-27	165	170	
Pac. Coast Cem. 6's, A	5- 3-28	97	98½	
Pacific P. C.[5] new com.	5- 4-28	.....	22	
Pacific P. C.	4- 5-28	76¾	80	25c mo.
Pacific P. C. pfd.	5- 4-28	77½	79	1.62½ qu. Apr. 5
Pacific P. C. notes[5]	3-22-28	99	.....	3% s.-a. Oct. 15
Pacific P. C. 6's	5- 4-28	.....	100	
Peerless Egyp'n P. C. com.[21]	5- 5-28	2½	3½	
Peerless Egyp'n P. C. pfd.[21]	5- 5-28	90	95	1¾% qu. July 1
Peerless Egyp'n P. C. war.[1]	5- 4-28	3	4	
Penn-Dixie Cem. 1st 6's[29]	5- 9-28	100½	101	
Penn-Dixie Cem. pfd.[28]	5- 9-28	95	96	1¾% Mar. 15
Penn-Dixie Cem. com.[28]	5- 9-28	28½	28¾	50c April 1
Petoskey P. C.	5- 8-28	11¾	12½	1½% qu.
Pittsfield L. & S.[31]	10- 8-27	.....	100	
Pittsfield L. & S. com.[31]	10- 8-27	.....	25	
Riverside P. C.	5- 8-27	190	200	50c mo..$1.50 x. Aug. 1
Rockland-Rockport Lime 1st pfd.[34]	5- 4-28	No recent quot.		* 3½% s.-a. Feb. 1
Rockland-Rockport Lime 2nd pfd.[34]	5- 4-28	No recent quot.		3% s.-a. Feb. 1
Rockland Rockport Lime com.[34]	5- 4-28	No recent quot.		1½% qu. Nov. 2
Sandusky Cem.	5- 8-28	185	190	$2 qu. Apr. 2
Santa Cruz P. C. bonds	5- 3-28	105½	107	6% annual
Santa Cruz P. C. com.	5- 4-28	86	.....	$1 qu. Apr. 1
Schumacher Wallboard com.	5- 4-28	22½	23⅞	50c May 15
Schumacher Wallboard pfd.	5- 4-28	25½	26	
Southwestern P. C. units	4-24-28	275	300	
Superior P. C., A	5- 5-28	47	47½	
Superior P. C., B[20]	5- 3-28	.....	35	
Trinity P. C. units[37]	5- 4-28	152	158	
Trinity P. C. com.[37]	5- 4-28	50	.....	
U. S. Gypsum com.	5- 8-28	72	73	40c qu. June 30
U. S. Gypsum pfd.	5- 8-28	124	125	1¾% qu. June 30
Universal G. & L. com.[3]	5- 9-28	2	3	
Universal G. & L. pfd.[3]	5- 9-28	15	20	1½% Feb. 15
Universal G. & L., V.T.C.[3]	5- 9-28	2	3	
Universal G. & L. 1st 6's[3]	5- 9-28	58	65	
Upper Hudson Stone 1st 6's, 1951[12]	12-28-27	92	.....	
Vulcanite P. C. 1st 7½'s[12]	12- 5-27	105	109	
Whitehall Cem. Mfg. com.[36]	5- 4-28	150	.....	
Whitehall Cem. Mfg. pfd.[36]	5- 4-28	98	.....	
Wisconsin L. & C. 1st 6's[15]	5- 9-28	100	.....	
Wolverine P. C. com.	5- 8-28	6	6½	15c qu. May 15
Yosemite P. C., A com.	1- 4-28	6	.....	

*Will be redeemed on May 20 at $110 and accrued dividends. †Holders of record May 4 have the right, until May 24, to purchase new common at $37 a share in the ratio of one share for each five held.

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, Chicago, Ill. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal Que.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Asbestos Corp. of Amer., 5 sh. pfd., 5 sh. com.[1]	$1 for the lot	.....
Atlanta Shope Brick and Tile Co[1]	25c	.....
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[1]	$400 for the lot	.....
Benedict Stone Corp. 1st 7's 1934[8]	.....	86
Blue Stone Quarry, 60 sh.[2]	$10¼ for the lot	.....
Eastern Brick Corp., 7% cum. pfd.[1]	40c	.....
Eastern Brick Corp. (sand lime brick) com.[1]	40c	.....
International Portland Cement Co., Ltd., pfd.	30	45
Globe Phosphate Co., $10,000 1st. mtg. bonds, $169.80 per $1000 paid on prin.	$50 for the lot	.....
Iroquois S. & G. Co., Ltd., 2 sh. com., 3 sh. pfd.[1]	$12 for the lot	.....
Knickerbocker Lime Co.[4]	105	.....
Missouri Portland Cement Co., 7% serial bonds	104¾	104¾
Olympic Portland Cement Co.[7]	.....	£1¾
Phosphate Mining Co.[1]	1	.....
River Feldspar & Mill'g Co., 50 com., 50 pfd.[1]	$200 for the lot	.....
Rockport Granite Co., 1st 6's, 1934	90	.....
Simbroco Stone Co.[2]	12	12
Simbroco Stone Co.,[9] 40 sh. pfd., par $50; 40 sh. com., par $10 (40 units)	$2 per unit	.....
Southern Phosphate Co.[6]	1¼	.....
Standard Gypsum Co., 10 sh. pfd., 5 sh. com.[2]	$35 for the lot	.....
Tensas Gravel Co., 180 sh. com.[1]	$1 for the lot	.....
Tidewater Portland Cement Co., 3000 sh. com.	$6525 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Wabash Portland Cement Co.[1]	60	100
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston. Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [7]Neidecker and Co., London, England. [8]Auction sale of $1000, Barnes & Lofland, Philadelphia, March 31, 1928. [9]Price obtained at auction by Wise, Hobbs & Arnold, Boston, on May 2, 1928.

American Aggregates Corp. Takes Over Coppock Gravel Properties

TAYLOR EWART AND COMPANY, Chicago and New York, have issued an elaborate prospectus, illustrated by photographs and graphs, in connection with the flotation of a $2,000,000 bond issue for the American Aggregates Corporation. The following extracts are of general interest:

Authorized $5,000,000, all series; to be presently outstanding $2,000,000 Series A. Principal and semi-annual interest payable (February 1 and August 1) in gold coin at the office of the trustee, the First National Bank of the city of New York. Debentures in coupon form in interchangeable denominations of $1000 and $500, registerable as to principal. Subject to redemption on any interest date, upon 30 days' published notice, to and including February 1, 1933, at 105% of the principal amount and accrued interest, and thereafter at said price less ½ of 1% of the principal for each year or part thereof elapsed after February 1, 1933. Interest payable without deduction for any federal income tax up to 2%. The corporation agrees to refund upon timely and appropriate application all personal property taxes and securities taxes of any state or of the District of Columbia not exceeding in any year 6 mills of the principal amount, and all income taxes of any such state or district, not exceeding in any year 6% of the interest upon the debentures.

Upon completion of the present proposed financing the capitalization of the corporation will be as follows:

	Authorized	Outstanding
Sinking fund gold debentures	$5,000,000	
Fifteen year 6%, Series A, due February 1, 1943 (this issue)		$2,000,000
Preferred stock ($100 par value)	1,250,000 Shares	1,250,000 Shares
Common stock (no par value)	*250,000	150,000

*20,000 shares have been reserved to provide for the exercise of stock purchase warrants.

Foreword

The refined sand and gravel industry has been developed because of a widespread demand for clean aggregates scientifically prepared to meet the requirements of modern construction methods.

The products of the industry are basic materials for many essential enterprises, including railroading, road building and maintenance (both concrete and gravel), as well as concrete construction of all kinds. The use of sand and gravel naturally parallels the use of cement. However, other broad markets exist, as gravel is used extensively as railroad ballast and in the construction and maintenance of gravel roads.

The widely diversified uses of sand and gravel are continuous and are becoming more numerous. This is an age of steel and concrete construction. An increasing volume of railway traffic requires well maintained rights of way. The almost universal use of motor vehicles makes necessary more and wider roads and their proper maintenance.

The production of refined sand and gravel is today an engineering and manufacturing enterprise. The business is far different from the usual conception—that of a hillside pit containing a steam shovel. The preparation and sale of aggregates is "big business" and thoroughly essential.

Evidence along these lines is submitted in the following text which contain the story of the American Aggregates Corporation,* the largest company of its kind in the United States.

The present bond issue of $2,000,000 of the American Aggregates Corp. comprises fifteen year 6% sinking fund gold debentures, Series A, with stock purchase warrants, dated February 1, 1928; to mature February 1, 1943.

1. The company is the largest producer of refined sand and gravel in the United States.
2. Refined sand and gravel are basic materials for numerous essential enterprises, including railroading, road construction and maintenance (both gravel and concrete), and concrete construction of all kinds.
3. The demand for the product is continuous and on the increase both as to volume and number of uses. The company's business is well balanced as to the different classes of consumers of the product and does not require carrying of inventories, as the volume of production can be quickly and economically regulated to meet changes in demand.
4. The company's control of the most strategically located supplies of raw material and the number and diversification of its markets place it in an extremely strong competitive position.
5. The company is dominant in its field from the standpoint of scale of operations and the application of advanced engineering and manufacturing methods to the production of aggregates, giving it important production, merchandising and financing advantages.
6. A fixed sinking fund beginning October 31, 1928, of $100,000 annually will operate toward the retirement of these debentures. It is expected that the sinking fund plus the proceeds from the exercise of stock purchase warrants will retire this entire issue prior to maturity.
7. Each debenture will carry a detachable warrant entitling the holder to purchase certain common shares of the corporation at attractive prices.
8. The balance sheet as of December 31, 1927, after giving effect to this financing and the appraisals of Sanderson and Porter, engineers, as certified by Arthur Andersen and Co., certified public accountants, shows net tangible assets of $2554 for each $1000 debenture.
9. Average annual net earnings for the four years ended December 31, 1927, before deduction of federal income taxes but after depreciation and depletion were 5.4 times interest charges on this issue and 2.9 times both interest and sinking fund requirements. Such ratios for the year ended December 31, 1927, were 7.1 and 3.9 times respectively.
10. The men who are responsible for the splendid record of the corporation will continue as the active management.

Business of American Aggregates Corp.

The American Aggregates Corp., a pioneer in its industry, is the largest and one of the lowest cost producers of refined sand and gravel in the United States. Sales in 1927 were in excess of 7,300,000 tons and orders are now running in excess of the production schedule for 1928, approximately 9,000,000 tons. Annual net profits have increased from about $2000 for the first year of operation 26 years ago to more than $857,000 for the calendar year 1927. Net worth of the business has increased from a few hundred dollars at its inception in 1902 to more than $3,345,000 as of December 31, 1927, exclusive of good will, after giving effect to this financing and an appraisal of the properties, almost entirely as a result of earnings reinvested in the business.

*The corporate name "American Aggregates Corporation" is used throughout this booklet to denote not only the present corporation but its precedessors, chiefly the Greenville Gravel Corporation.

The company produces refined sand and gravel, basic materials, for railroad ballast, highway construction and maintenance (both concrete and gravel), concrete construction of all kinds and for other commercial uses. Approximately 31% of the company's 1927 tonnage was sold to railroads for ballast, 40% to state, city, county and minor civil divisions for paving and highway construction and maintenance, 16% for concrete structural use and 13% for miscellaneous uses.

Railroad customers of the American Aggregates Corp. include: New York Central; Pennsylvania; Baltimore and Ohio; Grand Trunk; Michigan Central; Chesapeake and Ohio; Wabash; Hocking Valley; Wheeling and Lake Erie; Pere Marquette; Big Four; Erie; Chicago and Eastern Illinois.

The American Aggregates Corp. operates 16 strategically located plants in Michigan, Ohio and Indiana and has recently acquired three additional plants, making a total of 19 (including one of the largest in the world). These plants are so located with respect to quality, quantity and face of gravel deposits, transportation facilities, water supply, electric power, labor supply, market and other factors as to give the company important natural competitive advantages. The American Aggregates Corp. does about 30% of the entire refined gravel business in its competitive market and in certain parts a substantial larger percentage of the total.

Because of its large scale operations and because of the leading position of its engineering and consulting departments, the American Aggregates Corp. has its own organization for the repair and maintenance of all its gravel plant machinery and equipment. It designs and manufactures a large percentage of the machinery and equipment used in its own plants; and, in addition, designs and manufactures gravel plant machinery and equipment for others. The designing of plants and manufacture of machinery for other producers is an important phase of the company's business.

The company manufactures, under its own basic patents, road maintenance trucks primarily for the purpose of promoting the sales of refined gravel for the maintenance of secondary roads. Also it manufactures, under its own patents, concrete products, including concrete railroad crossing slabs in use by many railroads and concrete posts and markers sold largely to railroads.

The company sells substantial amounts of gravel and sand at retail at most of its plants, this business amounting in 1927 to about 370,000 tons. In addition it owns and leases on favorable terms to the United Fuel and Supply Co. two well located and finely equipped distributing yards at Detroit. These yards handle the company's products exclusively and in 1927 retailed 1,000,000 tons.

DISTRIBUTION OF TONNAGE BASED UPON USE FOR THE YEAR 1927

	Sand (tons)	Gravel (tons)	Approximate % of total
Paving	1,020,373	1,944,611	40
Ballast		2,282,146	31
Structual	528,790	683,258	16
Railway fills and bank runs	364,075	473,530	11
Filtration	3,628	7,132	2
Total produced and shipped	1,916,866	5,390,677	100

Direct Railroad Connections

MICHIGAN—(1) Brighton (two plants), Pere Marquette. (2) Oxford, Michigan Central; Grand Trunk. (3) New Hudson, Grand Trunk. (4) Somerset Center, New York Central. (5) Kalamazoo, Grand Trunk; Michigan Central; Pennsylvania.

INDIANA—(6) Richmond (two plants), Pennsylvania; Chesapeake and Ohio; Traction. (7) Logansport, Pennsylvania; Wabash. (8) Terre Haute, Pennsylvania; New York Central; Chicago and Eastern Illinois. (9) Pleasant Lake, New York Central.

OHIO—(10), Fort Jefferson, New York Central. (11) Massillon, Pennsylvania; Baltimore and Ohio; Wheeling and Lake Erie. (12) Columbus (four plants), Pennsylvania; New York Central; Hocking Valley. (13) Urbana, Pennsylvania; Erie; New York Central. (14) Germantown, New York Central; Baltimore and Ohio.

Being a basic material of concrete, the use of gravel closely parallels the use of cement, but there is a substantial market for gravel for railroad ballast and highway construction and maintenance independent of its use in concrete construction.

The following table shows the production of cement and gravel in the United States during the 10-year period 1917-16, inclusive, according to the United States Bureau of Mines:

Year	Cement No. of barrels shipped	Gravel No. of tons produced
1917	90,703,474	35,573,819
1918	*70,915,508	*28,704,606
1919	85,612,899	34,606,671
1920	96,311,719	38,265,256
1921	95,507,147	41,350,054
1922	117,701,216	45,172,123
1923	135,912,118	72,566,882
1924	146,048,000	80,658,053
1925	157,295,212	84,819,251
1926	162,187,090	90,986,539

spectacular concrete structures, such as huge dams and great bridges, individually call for considerable quantities of cement, their number is so small comparatively that they constitute a much less important factor in the total demand for cement than the more commonplace classes of work.

The market for gravel as a constituent part of concrete is a substantial and widely diversified one, but there is also a substantial market for gravel for railroad ballast and gravel road construction and maintenance. The following table is a classification of gravel tonnage produced for building, paving and railroad ballast by the nine leading states in 1926, according to figures published by the U. S. Bureau of Mines:

State	Total	Building gravel	Paving gravel	Railroad ballast gravel
Michigan*	8,120,002	2,829,874	3,976,041	1,314,087
Illinois	6,871,300	2,721,005	2,667,220	1,483,075
California	6,598,539	3,098,910	2,821,921	677,708
New York	6,516,770	3,629,330	2,717,299	170,141
Ohio*	6,258,907	1,774,593	1,925,979	2,558,335
Indiana*	5,964,135	988,709	2,220,951	2,754,475
Wisconsin	4,514,357	1,817,396	1,965,255	731,706
Penn.	4,495,029	2,737,927	1,698,407	58,695
Texas	3,752,741	1,285,466	1,135,729	1,331,546

*Note the relative standing of the three states in which the American Aggregates Corp. operates and in which it is by far the largest producer.

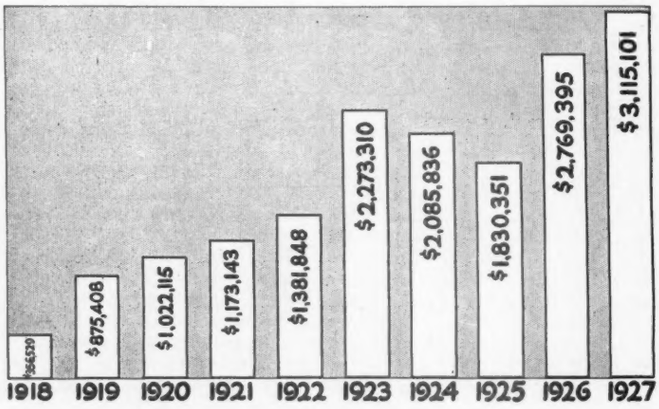
Position of the Company in Its Field

American Aggregates Corp. was one of the first to build plants for the refining and grading of gravel and the production of aggregates according to present day specifications. Early, it acquired the strategically located deposits, carefully selected from the standpoint of quality of raw material, the depth of the overburden, depth of the deposit, railway transportation facilities, as well as the supply of water, power and labor and the extent of the deposit.

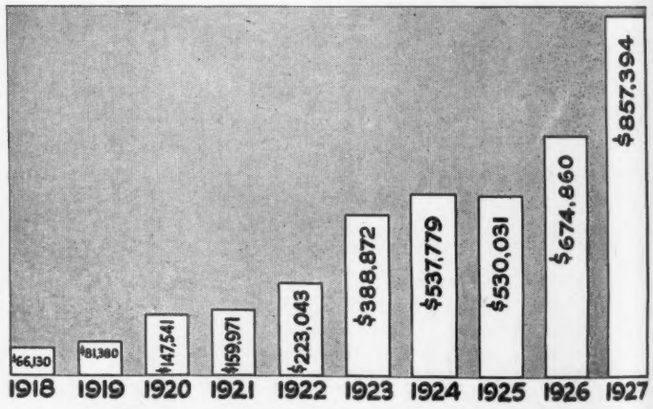
plants enables it to deliver material for long road construction jobs at various positions with the lowest transportation costs, and obviates the necessity for the buyer to contract with many different sources of supply, with possible variation in the quality of material or failure on shipments due to shutdowns. Likewise, because the company has plants located at intervals along most of the important railroad lines traversing its territory, it is favorably situated to supply their ballast requirements.

The size and scope of operations make it feasible for the corporation to employ the very best administrative, merchandising and engineering ability available. Its engineering and consulting department is a recognized authority on plant location, design and construction.

The business, as conducted by the American Aggregates Corp., is essentially a manufacturing business, and its success, while depending to a fundamental extent on location, is also largely a matter of efficient and economical production. The business offers all the advantages to the large scale producer as against the small producer that any other manufacturing industry does. On this basis, the corporation has an advantage over all its competitors. While it has competition in its various markets, it has no competitor of equal size with the same long experience, comparable equipment, comparable engineering staff, as low maintenance costs, favorable location of plants, and transportation facilities, paralleling it in all or any considerable portion of its markets. It is significant that the corporation has been able to purchase the properties of competitors in many important instances on very advantageous terms and that in no single case has any new competitor entered any market



Growth in sales—1918 to 1927, inclusive



Growth in net earnings—1918 to 1927, inclusive

In view of the fact that gravel is a basic material of concrete, the estimate published by the U. S. Geological Survey of the percentage of all cement employed for various purposes is of interest:

Use	Per cent
Public and commercial dwellings	14.9
Dwellings	9.4
Sidewalks and private driveways	6.9
Miscellaneous farm uses	20.6
Concrete pipe for water sewers, irrigation and culverts	4.3
Paving and highways	24.0
Railways	5.2
Bridges, rivers and harbor work, dams and water power projects, storage tanks and reservoirs	3.0
Miscellaneous uses	11.7
	100.0

It is significant to note with respect to the stability of the demand for gravel as a basic material for concrete that while the more

The accompanying map shows the location of the corporation's 19 plants. The numbered lines radiating from each of the 16 plants which were in operation during 1927 represent the actual tonnage shipped that year into the indicated counties. These amounts are exclusive of gravel sold direct to railroads for ballast which amounted to 2,800,000 tons more. No shipments are shown from the Terre Haute, Ind., plant, as its entire output was sold for ballast.

With the three new plants at Oxford and New Hudson, Mich., and Pleasant Lake, Ohio, in operation, it is apparent that the corporation's natural market includes practically the whole of the three states. The plants are all located on railroad lines with switching and car storage tracks alongside the plant.

The wide distribution of the corporation's

where the corporation was already operating. The corporation, from the beginning, has adhered to a policy of a fair price and large volume with a small margin of profit, continually striving for more efficient operation. This policy his discouraged the entrance of others into the field.

History and Growth

The business of the American Aggregates Corp. (formerly the Greenville Gravel Corp.) was started 26 years ago by F. D. Coppock, now president of the corporation, at Ludlow Falls, Ohio. The only refinement of the material consisted in screening by hand. It was loaded on cars by means of a plank and a wheelbarrow, with an output of one car of 50 tons per day and net profits per car of $10. Annual production was approximately 200 cars and annual net profits $2,000

compared with more than 146,000 cars of refined material loaded and shipped in 1927 and net profits of more than $857,000.

Shortly after the inception of the business, gravel beds were leased by Mr. Coppock at Fort Jefferson, Ohio, and more active operations were started with a maximum of 35 men employed to load cars by means of wheelbarrows. By the spring of 1904, the volume of business necessitated the substitution of machinery for hand labor, and a partnership composed of F. D. Coppock, J. F. Coppock, J. M. Miles, W. O. Patty and William Patty was formed and a steam shovel purchased. Operations were on a relatively small scale until 1909, when a washing, crushing and screening plant was erected at Fort Jefferson, Ohio, to meet the demands of engineers for a clean, sized aggregate. This was one of the first plants of the kind in the United States.

The present management of the American Aggregates Corp. were pioneers in this manufacturing process and soon placed their operations on a sound engineering basis.

The business was incorporated in June, 1911, as the Greenville Gravel Co. In 1914, after securing a contract for ballast from the Cleveland, Cincinnati, Chicago and St. Louis Railway, the company built a plant at Mechanicsburg, Ohio, and during the same year a plant was erected at Ackerson Lake, Mich. Additional strategically located gravel deposits were subsequently acquired and plants constructed in the states of Indiana, Michigan and Ohio, and incorporated as separate companies, all of which were, in 1925, consolidated into the Greenville Gravel Corp. with an authorized and issued capitalization of $1,250,000 preferred stock and $2,500,000 in common stock. In 1928 the name of the corporation was changed to the American Aggregates Corp.

Since the consolidation in 1925, additional properties were acquired. Now the corporation operates 19 strategically located modern gravel plants in the states of Indiana, Michigan and Ohio, with a scheduled production of approximately 9,000,000 tons for 1928, and two concrete plants. The corporation owns and operates a machinery and equipment plant which handles all of its maintenance and repair work, manufactures a large percentage of the machinery and equipment used by the corporation, and manufactures machinery and equipment for other gravel and sand producers.

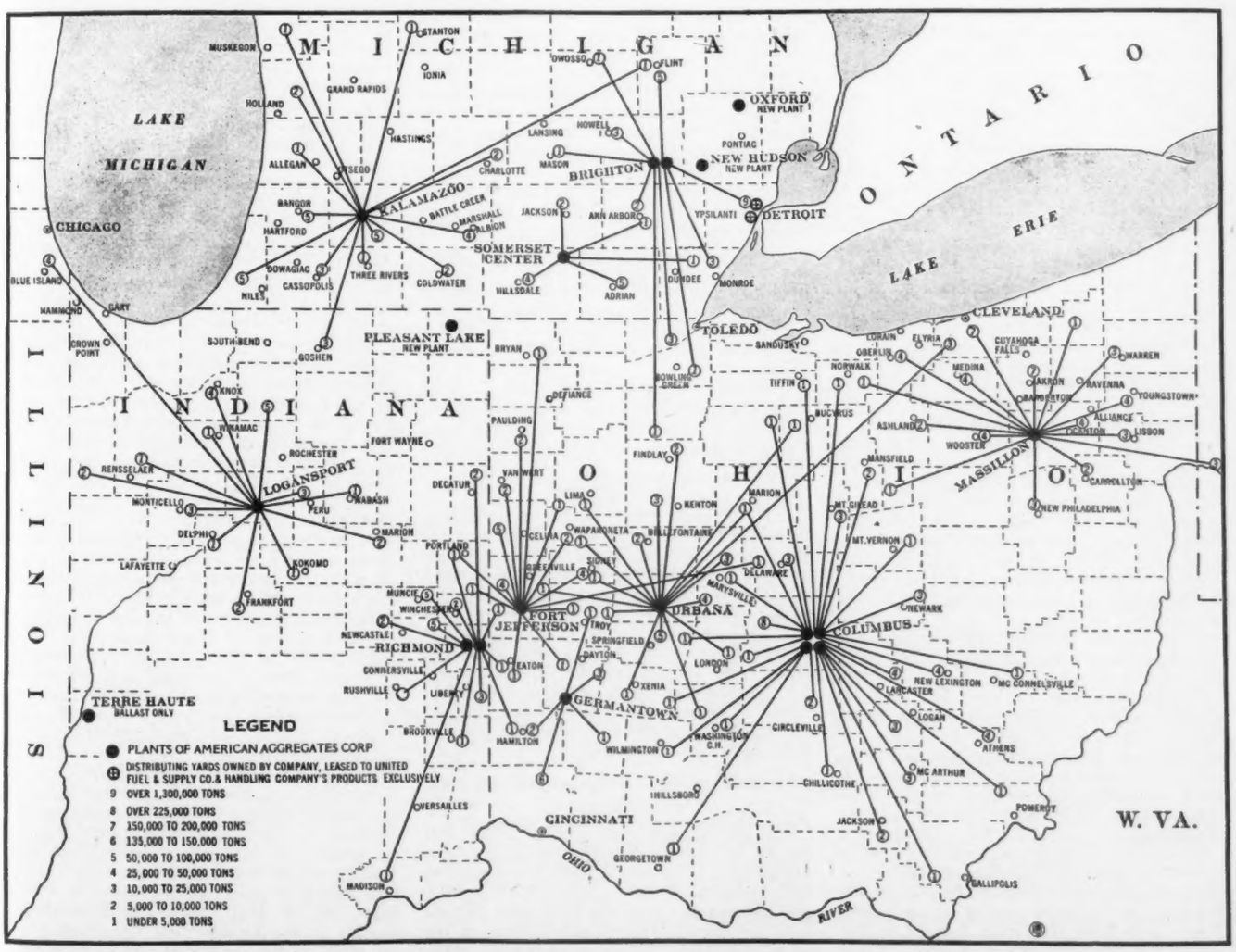
Properties

Properties of the American Aggregates Corp. comprise 19 large refined gravel and sand producing plants with a combined annual capacity of 12,000,000 tons; distributing yards, of which two are operated by the company and two are operated by the United Fuel and Supply Co. in Detroit, Mich., as lessor; three concrete products plants engaged in the manufacture, under its own patents, of concrete slabs for railroad crossings, concrete posts, markers, etc.; a machinery plant engaged in the manufacture and maintenance of gravel and sand plant machinery and equipment, and also engaged in the manufacture, under its own basic patents, of road maintenance trucks, largely for the purpose of promoting the sale of refined gravel and aggregates for road maintenance.

Sanderson and Porter, engineers, report that the 599 acres of the 2636 acres of gravel land owned by the company in fee and the 625 acres of the 3522 acres held by the company under lease, which they have examined and which they estimate to be sufficient for 20 years' operation, contain approximately 170,000,000 tons of recoverable gravel.

The same engineers have appraised the fixed assets of the company, exclusive of valuable leaseholds, at $4,042,629.

Coupled with other location factors such as railroad transportation facilities, the market, power supply, water supply and other factors, quality, quantity and face of gravel deposits are of fundamental importance. Gravel deposits of the American Aggregates Corp., owned in fee and held under lease, have been selected on the basis of the composite of location elements with preliminary surveys, well tests of gravel lands together



Location of American Aggregate Corp. plants in Ohio, Indiana and Michigan. Numbered lines show tonnage shipped to indicated locations in 1927, but do not include gravel for railroad ballast. Plants without lines not operating in 1927 except Terre Haute plant, which shipped ballast only

with the design and construction of plants and machinery under the supervision of the company's engineering department, headed by F. M. Welch, recognized as an outstanding authority in the United States on gravel plant location, design and construction.

Earnings

The audit of Arthur Andersen & Co., certified public accountants, shows earnings of the corporation as follows:

		Number of times annual interest charges on this issue	Number of times annual interest and sinking fund charges on this issue
Net earnings for the year ended Dec. 31, 1927, before deduction of federal income taxes, depreciation and depletion	$1,128,949.38	9.4	5.1
Average net earnings for the four years ended Dec. 31, 1927, before deduction of federal income taxes, depreciation and depletion	846,710.78	7.0	3.8
Net earnings for the year ended Dec. 31, 1927, before deduction of federal income taxes, but after depreciation and depletion	857,394.35	7.1	3.9
Average annual net earnings for the four years ended Dec. 31, 1927, before deduction of federal income taxes, but after depreciation and depletion	650,016.36	5.4	2.9

Year	Net available for dividends*	Preferred dividend requirement	Earnings applicable to common	Earnings per share of common†
1924	$361,379	$87,500	$273,879	$1.83
1925	354,677	87,500	267,177	1.78
1926	379,954	87,500	392,454	2.61
1927	637,846	87,500	550,346	3.66

*After depreciation, depletion, federal income taxes and interest on $2,000,000 debentures.
†Based on 150,000 shares of common now outstanding. Stock purchase warrants accompanying these debentures call for 20,000 additional shares.

As of April 1, 1928, the sales contracts of the corporation were materially in excess of any previous year at that date. It is estimated that net earnings after depreciation and depletion, for the year 1928 will be substantially in excess of 1927 earnings.

Management

The management of the corporation is in the hands of the men who have built it into the largest and most successful gravel producer in the United States.

F. D. Coppock, president, is one of the original founders of the business in 1902. He is in his early fifties and has spent his whole business life in the gravel business. A pioneer in the refining of gravel, he is responsible for many of the methods now in general use. A man of exceptional executive ability and vision, he is recognized as one of the outstanding operators in the gravel industry in the United States.

C. E. Patty, vice-president and general manager, is a practical gravel operator who is thoroughly familiar with every phase of the business. He has served the corporation in many capacities during the last 12 years.

G. C. Baker, vice president, has successfully developed for the last seven years the effective sales organization and sales methods which have contributed largely to the corporation's growth.

H. R. Brown, secretary and treasurer, has been associated with the corporation since its inception in 1902.

F. M. Welch, chief engineer, is a graduate of the College of Engineering, University of Illinois. For many years sales manager of the Webster Manufacturing Co. at Tiffin, Ohio; organizer and head of the corporation's consulting engineering department; recognized as an authority on gravel plant construction.

The vision of the above men in acquiring control of the most advantageously located gravel deposits and their leadership in the designing and efficient operation of gravel plants have been important factors in the success and growth of the corporation. These combined with the corporation's progressive sales methods and its development of the market for refined gravel have placed the corporation in a position by itself in the industry.

Stock Purchase Warrants

Each debenture of the present issue carries a detachable warrant entitling the holder to purchase certain shares of the no par value common stock of the American Aggregates Corp. An estimate of the value of these stock purchase privileges may be gained by a study of the following earnings table:

The figures above do not reflect any benefits from the operation of three large plants recently acquired which will be in operation during 1928. It is estimated that for 1928, net earnings applicable to the common stock will approximate $5 per share on the 150,000 shares of common stock outstanding.

In 1927 the corporation showed earnings of $3.66 per share applicable to 150,000 shares of common stock, and the value of this stock may be estimated at ten times such earnings or $36.60 per share.

The stock purchase warrants accompanying the debentures of this issue entitle the holder of each $1,000 debenture to purchase ten shares of the common stock of the corporation at $30 per share, on or before January 31, 1931, and thereafter at higher prices.

The value of the first option called for by these warrants is obvious, and as net earnings of the corporation grow, the value of the stock purchase warrants will be increasingly great.

Sinking Fund

The indenture under which these debentures are now to be issued will provide for the payment into a sinking fund of $100,000 per annum on or before October 30 of each year, beginning in the year 1928. The funds to be received by the corporation from the sale of its common stock upon the exercise of the stock purchase warrants mentioned below must be used to retire debentures, and it is anticipated that such application of funds in conjunction with the operation of the sinking fund should retire this issue of debentures before maturity.

The Production of Aggregates—A Basic Industry

The development and progress of the last decade is very properly attributed to the availability of cheap, rapid transportation made possible by the resourcefulness, skill and courage of those who have been responsible for the tremendous advancement in the automotive field. Making available this means of transportation has furnished unmeasured employment to labor in the production and transportation of the raw material and its manufacture into the finished product. Engines, cars and ships were used for transportation. Steel and concrete buildings were erected to provide the means of manufacture and administration. The cumulative effects of these activities are largely responsible for the prosperity and living comfort which we now enjoy.

The growth of the automotive industry has been spectacular. Coincident with this growth another industry has developed in the production and preparation of aggregates which form the basis for the development of adequate transportation facilities. That this development has not been spectacular is perhaps due to the fact that the building of streets and highways has not kept pace with the increase in transportation facilities. This fact provides a factor of safety to the aggregates industry, which includes the production and preparation of sand, gravel, and stone products.

The widely diversified uses of gravel are continuous and increasing. The growing volume of railroad traffic necessitates well-maintained roadbeds. The increasing burden of motor traffic calls for more and wider roads and their proper maintenance. Prepared gravel is used in greater volume each year in concrete construction work.

The production of prepared sand and gravel has become an engineering and manufacturing enterprise—a radical advance from the roadside pit from which it has grown. The demand for better highways and the advancement of structural engineering represented in the building of bridges and buildings has resulted in rigid specifications as to materials to be used in such construction. These specifications have lifted the production of sand and gravel from a casual, minor, roadside business to an industry of first importance requiring skillful engineering management and the use of substantial machinery designed particularly for the industry.

Gravel is produced and prepared by various methods, depending on the nature of the deposit. The selection of the deposit is important, and careful and exhaustive tests must be made to determine not only its extent but its character.

The removal of the material is accomplished in ordinary deposits which are above drainage level by the use of steam shovels by which the material is placed in cars and hauled to the plant for preparation. Dragline operations are conducted where the deposit is about water level or in river beds. Many of the best deposits are located at a considerable depth below the water level. In this case the material is collected by suction dredges employing large centrifugal pumps to force the water and gravel through pipes to the plant for preparation. In all three cases the material is raised to a point from which it passes by gravity through an intricate system of revolving screens. The large stones are separated and pass through crushers, after which they are rescreened into the various sizes. All of the material is washed to free it from loam or other foreign material which might prove detrimental in its proposed use.

Gravel is probably the cheapest prepared commodity used, and in nearly every instance the freight charges to destination exceed the value of the material on the cars at the point of origin. Accessibility to market at low transportation cost is, therefore, of prime importance in selecting the location for a plant and has been one of the determining factors in the location and construction of the plants of the American Aggregates Corp.

The business of the corporation is not seriously affected by temporary adverse conditions in general business, as a substantial

proportion of its product is purchased by state, county and city departments, having at their disposal funds raised by general taxation for the construction and maintenance of highways and streets. These funds are collected and available regardless of general business conditions. In fact, during periods of business depression the amount of this work is usually increased to relieve unemployment and to take advantage of lower labor costs.

ASSETS

Current assets:		
Cash		$615,951.59
United States government securities		436,757.75
Notes and accounts receivable:		
Notes rec., customers	$70,023.92	
Accts. rec., customers..	541,495.68	
Sundry accts. rec.....	26,033.12	
	$637,552.72	
Less res. for bad debts	18,151.27	619,401.45
Inventories—As certified by the management at cost or market, whichever lower.—Stock pile, mfg. material, supplies, etc.....		213,102.46
Total current assets.....		$1,885,213.25
Other assets:		
Railroad right of way —land cost, less sales	53,487.73	
Sundry	4,850.00	58,337.73
Investments in affiliated cos.:		
Permanent Concrete Products, Inc., 57.4% owned	28,700.00	
Western Ohio Gravel Co., 50% owned.....	100,000.00	
Sundry	15,242.45	
		143,942.45
Deferred charges (including unamortized bond discount and expense)....		236,243.47
Fixed assets (at estimated replacement costs new, less allowance for deprn., as reported by Sanderson & Porter as of Dec. 31, 1927).....		*4,042,629.00
		$6,366,365.90

*Appreciation surplus of $896,176.97 resulting from adjustment of book values to appraised values has been absorbed in write-off of goodwill of $1,046,072. The balance of the goodwill account was charged to earned surplus.

LIABILITIES AND CAPITAL

Current liabilities:		
Accounts payable		$59,658.35
Accrued royalties, taxes, int., etc...		28,343.97
Accrued dividend on pfd. stock.....		21,875.00
Dividend payable on com. stock.....		375,000.00
Due to officers and employes.....		100,990.55
Res. for fed. inc. taxes, subject to review by Treasury Dept.....		125,000.00
Due to affiliated companies.....		43,978.90
Total current liabilities.....		$754,846.77
(Sinking fund installment due Oct. 31, 1928, $100,000.)		
Real estate purchase obligations, due 1929-1933:		
Contracts	$235,657.14	
Notes	31,250.00	
		265,907.14
15-yr. 6% sinking fund gold debentures, Series A, due Feb. 1, 1943 —Authorized, $5,000,000.		
Issued and outstanding.....		2,000,000.00
Capital stock and surplus:		
Capital stock:		
Pfd., 7% cumulative Auth., 25,000 shares, $100 par value.		
Issued and outstanding, 12,500 sh.....	$1,250,000.00	
Com., no par value. Auth.. 250,000 sh. (of which 20,000 sh. have been reserved to provide for the exercise of stock purchase warrants)		
Issued and outstdg., 150,000 shares.....	1,750,000.00	
Earned surplus	345,611.99	
		3,345,611.99
		$6,366,365.90
Contingent liabilities:		
Notes rec. discounted and accommodation endorsement	$ 9,500.00	
Suit claiming encroachment of property (est.)	10,000.00	

The American Aggregate Corp. bonds have already been listed on the New York Curb Stock Exchange. In a $10,000 transaction May 8 the bonds changed hands at 106.

Monolith Cement Earnings

PROFITS of the Monolith Portland Cement Co. before providing for reserves for depreciation and federal taxes amounted to $597,984 in 1927, according to a report issued by the company. This compares with $617,968 in 1926, a decrease of $19,984 or 3%.

Net income after allowing for preferred stock dividends amounted to 32% on the common stock or approximately 33 cents per barrel. Average yearly profit over a five-year period, after providing for preferred dividends, amounted to $473,300, which is equivalent to 32% of common stock or 44 cents per barrel.

Shipments of cement during 1927 showed an increase of 89,529 bbl., gaining from 1,356,264 to 1,445,793 bbl. in 1927. Profit per barrel declined from 45 cents in 1926 to 41 cents in 1927.

Total assets of the company amounted to $6,300,119, of which $151,524 was cash on hand and in banks. Accounts receivable aggregated $420,918 and inventories totaled $203,366. Investments amounted to $58,080 and fixed assets aggregated $5,425,956.

The Monolith Portland Cement Co. was incorporated under the laws of Nevada in 1920. The plant is located at Monolith, Kern county, California. Production is in excess of 4000 bbl. daily.—*Los Angeles* (Calif.) *Times.*

Celite Company Bonds Offered

FIRST SECURITIES CO., Los Angeles, Calif., and E. H. Rollins and Sons, Chicago, Ill., are offering $1,750,000 first mortgage 6% serial gold bonds, series A of the Celite Co., Los Angeles, Calif. Price 100 and interest to yield 6%. Dated September 1, 1927. Due March 1, 1930 to 1942, inclusive. The following data are from a letter of August Fitger, president of the company:

Company—The Celite Co., a Delaware corporation, controls, through ownership of all the capital stocks, the following subsidiaries: The Celite Products Co. of Maine, a sales corporation having 19 offices in the United States; Celite Products, Ltd., a Canadian corporation with offices at Montreal, Canada, and Celite Products Corp., a Delaware corporation, doing business in London, England.

The company owns approximately 2200 acres of diatomaceous silica—a basic substance, minutely porous and practically pure silica—the only known deposits of such quality and quantity in the world. The mineral deposits and manufacturing plants of the company are located just south of Lompoc, Calif. The company and its predecessors have been obtaining their supply of Celite material from these deposits for about 23 years. More than 20,000,000 tons of this material have been blocked out as readily available. The company could increase its annual output several fold and the tonnage of material now blocked out would still be sufficient to supply its needs for many years beyond the last maturity of the series "A" bonds.

Earnings—According to an audit made by Messrs. Haskins and Sells, certified public accountants, the net earnings of the company, after depreciation and depletion, available for the payment of bond charges, for the 4½ years ended June 30, 1927, have averaged annually $460,564, or more than 4.38 times the maximum annual interest charge on these bonds, namely, $105,000, and 2.36 times the average annual amount required to pay the interest and principal on these bonds, namely, $195,192. For the 2½ years ended June 30, 1927, such net earnings averaged annually $568,880 or 5.42 times the maximum annual interest charge and 2.92 times the average annual amount required to pay the interest and principal on these bonds.

Alpha Portland Cement Co. to Issue New Stock

THE directors of the Alpha Portland Cement Co. Easton, Penn., have authorized the acquisition of the plant of the Phoenix Portland Cement Corp. at Birmingham, Ala., and in connection with the increase of business have authorized the issuance of 118,500 shares of the company's common capital stock of no par or nominal value.

Each stockholder is offered the right to subscribe for his proportion of the new stock in the ratio of one share of new stock for each five shares of existing common stock held by him and as of record on the company's books at the close of business May 4, 1928. The subscription price of the new stock is $37 a share. The offer expires May 24, 1928.

The directors have contracted for compensation with the firm of Wood, Struthers and Co. of 20 Pine street, New York City, to underwrite at the full price of $37 per share all stock not subscribed for by the stockholders. The company will receive the same amount for the new stock, whether it is subscribed for by the stockholders or taken by the underwriters.

U. S. Gypsum Dividend

DIRECTORS of the U. S. Gypsum at their meeting on May 9 declared regular quarterly dividends of 2%, or 40 cents a share, on the common stock and 1¾% on the preferred. Both dividends are payable on or before June 30 to stockholders of record June 15.

International Cement to Increase Capital

THE New York Stock Exchange has received notice from the International Cement Co. of a proposed increase in the authorized common stock from 600,000 to 1,000,000 shares.

New York Crushed Stone Men and Gravel Producers Hold Joint Session

Syracuse Meeting Discusses Credit Plan with Contractors

MEETING at a joint luncheon on April 27, the members of the New York State Crushed Stone Association and the Empire State Sand and Gravel Association, together with representatives of the New York State Highway Chapter of the Associated General Contractors, got together for an unusually constructive session. The meeting was held at the Syracuse hotel in Syracuse, N. Y. After the joint session, separate meetings were held by the two aggregate associations.

At the opening of the joint session, George E. Schaefer, of the General Crushed Stone Co., president of the New York Crushed Stone Association, was unanimously chosen chairman of the meeting. The discussion centered around the proposed credit plan which was put forward by the contractors of the state to eliminate some of the undesirable practices not uncommon among the less scrupulous contractors. While the meeting was largely called to benefit the contractors' group, there can be no question that the clarifying of the credit situation would react to the benefit of the aggregate men.

John G. Carpenter, secretary-treasurer of the sand and gravel association, made a report of the committee meeting held at Albany on April 10 when representatives of the three groups were present. The report urged the adoption of a uniform period for the allowance of a discount to the purchaser, this period to be the same for both the crushed stone producers and the sand and gravel companies. This would necessitate a uniform billing date (the first of each month) for all the producers it was pointed out. It was further shown that a producer could, if he wished, stop the shipment of material to a contractor who failed to pay his bills for the previous month before a specified time. The advantage to the producer is easily seen in the definite plan which he has to work under, together with the fact that no contractor could get more than a month behind with his payments and still receive shipments. For the contractor, the advantage was pointed out by Eugene Forrestel, president of the New York Chapter of the A. G. C. when he said that the contractors would be better able to look ahead if they were required to meet a definite plan. Richard Hopkins, secretary and treasurer of the contractors, added that it would lessen the probability of a contractor assuming more work than his outfit and equipment would permit him to handle economically. This will mean better work for the public, more money for the contractor and fewer bad accounts for the material producers, according to Mr. Hopkins.

A. J. Hooker, of the Buffalo Crushed Stone Co., urged an increase in the bond required of contractors as an aid in obtaining better work with less loss, but Mr. Hopkins pointed out that it would be practically impossible to have a bill increasing the bond passed by the legislature, due to the opposition of cities and large towns. He also said that even if such a bill could be passed it would not be certain to correct the evil since "any fool can get a bond" no matter how high it is placed.

F. C. Owens agreed that the producers might be willing to adopt some credit plan, but wished to find out if the contractors had enough faith in their organization to be certain that the members of the A. G. C. would be fair to producers who would adopt some plan beneficial to the contractors. Mr. Forrestel replied that it would be rather hard to answer that question definitely, but that he felt certain that the members of the A. G. C. would live up to the plan.

Sand and Gravel Meeting

The two associations held separate meetings following the luncheon at which, for the most part, the proposed credit plan was discussed. The sand and gravel association adopted a resolution which stated that it was the consensus of opinion of the meeting that a 10 cents per cu. yd. discount should be allowed purchasers of material who pay their bills before the 10th of the following month.

A discussion followed concerning the status in the association of crushed stone producers who also produced sand and gravel. It was decided that any producer, whether affiliated with a quarry company or not, was eligible to membership in the association if he was operating a separate company specifically incorporated to do business in the sand and gravel field.

Registration

The following sand and gravel producers were present at the meeting:

Consolidated Material Co., Rochester: H. T. Marsh, vice-president of the Empire State Sand and Gravel Association.

Madison Sand and Gravel Co., Hamilton: J. G. Carpenter, secretary and treasurer of the Empire State Association, and C. A. Adams.

Nathan Oaks and Sons, Oaks Corners: Nathan Oaks and Carlton Oaks.

Rome Cast Stone Co., Rome: D. L. Evans.

Buffalo Gravel Corp., Buffalo: H. A. Stelly.

Clarence Supply Co., Buffalo: M. P. Ripley.

Eldredge & Robinson, Auburn: J. W. Robinson.

Crushed Stone Meeting

In the discussion of the contractor's credit plan, it was brought out that many of the quarry companies already have practically this plan in operation. W. L. Sporborg declared that he felt it an absolutely necessary procedure. It was felt by many that it certainly increased business. An urgent plea to look at the whole matter with a broad-gage point of view was made by A. G. Seitz. He felt that the entire business could be straightened out if some real attention was paid to it.

The committee which had functioned at the April 10 meeting at Albany was requested to proceed with its work by a vote of the members present.

Registration

The following crushed stone companies were represented:

General Crushed Stone Co., Easton, Penn.: George E. Schaefer, president of the New York State Crushed Stone Association.

Buffalo Crushed Stone Co., Buffalo: A. J. Hooker, James Savage and F. W. Schmidt.

Le Roy Lime and Stone Co., Le Roy: J. L. Heimlich, D. E. Moore and D. C. Moore.

Dolomite Products Co., Rochester: John Odenbach, H. N. Clark and Walter Sickles.

Rock Cut Stone Co., Syracuse: W. L. Sporborg, F. C. Owens and A. G. Seitz.

Peerless Quarries, Inc., Utica: A. S. Owens.

Wickwire Spencer Steel Co., Inc., Gasport: W. E. Foote.

Cushing Crushed Stone Co., Schenectady: J. E. Cushing.

Worlock Stone Co., Canastota: C. B. Ellis.

Solvay Process Co., Syracuse: J. H. Kaiser and Leslie Crate.

Adams and Duford Co., Chaumont: E. B. Johnson.

Watertown Stone Products Co., Watertown: S. D. Ormsby.

J. N. Callanan Road Improvement Co., South Bethlehem: B. R. Babcock.

The representatives of the contractors' association were:

E. P. Forrestel, president of the New York State Highway Chapter of the A. G. E.

Richard Hopkins, secretary and treasurer of the chapter.

Harry Hayes, engineering secretary.

The following guests were present: B. H. Norton, E. I. du Pont de Nemours & Co.; L. D. Hudson, Symons Bros. Co., New York City; H. D. Alexander, Link-Belt Co., Utica; N. S. Snyder, Link-Belt Co., Buffalo; J. Barab, Hercules Powder Co.; Wm. Anderson, Hercules Powder Co., Buffalo; J. J. Landy, Cement-Mill and Quarry, New York City; H. M. Fitch, Rock Products, Chicago.

Why Lime Manufacturers Should Attend the New York Convention

Meeting at New York, May 23-24, the One Big Opportunity to Hit Upon a Constructive Program for the Resuscitation of the Lime Industry

EVERY RACE OF MANKIND has been through a stage of civilization marked by *individualism*. In the case of the races from which we Americans come this stage of civilization was passed many centuries ago, in so far as social and political life is concerned. It still obtains as a part of the business creed of some men.

In an individualist state of society every man is a law unto himself. If a fellow member of his tribe murders his relative, he murders a relative of the murderer, if he cannot avenge his wrong in the more direct way. If he wants or needs something, and feels strong enough to retain it against attempts to recover by former owners, he takes and holds what he wants.

To justify this kind of social organization today would be absurd or insane. Why attempt to justify it in business, which is part and parcel of our social organization? For the good of the race—for society—centuries ago civilized man relinquished *rights* and *prerogatives* he had "enjoyed" from the beginning of his race. Intelligence gained by experience and reasoning compelled him to make the change.

Only recently, however, have many otherwise civilized men discovered that business, as a part of society, must come under the same laws of nature. An industry that still believes in a policy of "dog eat dog" is still in a stage of civilization of the caveman era; and to attempt to defend this policy is a case of the old woman attempting with her broom to sweep back the sea.

"American business," said Lewis E. Pierson, president of the Chamber of Commerce of the United States, at the recent Washington convention, "has reaffirmed its conviction that the way to preserve the progress already made and to achieve even greater things for industry and for the nation, is through common thought and common action for the common good."

The Common Good of the Lime Industry

(1) The *common good* of the lime industry demands, first of all, that personal animosities be laid aside; let bygones be bygones; be reasonable enough to believe that acts committed under financial stress and misunderstanding will not be repeated under conditions of mutual understanding.

(2) The *common good* of the lime industry demands a price for the product that will yield the capable and efficient producer a *fair profit*. It is unlawful and against public policy to raise prices by agreement and collusion; but it is not unlawful and it is for public policy for every producer to determine his cost of production and to sell *none* of his product for less than his cost, or for less than cost plus a fair profit. It is not unlawful and it is for public policy that lime manufacturers exchange and study their cost data, that one may know whether he is efficient or inefficient.

> ***WHEN the mariner has been tossed for many days in thick weather, and on an unknown sea, he naturally avails himself of the first pause in the storm, the earliest glance of the sun, to take his latitude, and ascertain how far the elements have driven him from his true course. Let us imitate this prudence, and before we float farther on the waves of this debate, refer to the point from which we departed, that we may at least be able to conjecture where we are now.—Daniel Webster.***

(3) The *common good* of the lime industry requires that the industry as a whole be made an efficient one—both in production and distribution. In the opinion of those qualified to judge, the lime industry is not now efficient in either. In the interests of public welfare an inefficient industry must go; in the interests of the lime industry, inefficient operations must be made efficient or must go.

(4) The *common good* of the lime industry demands co-operative watchfulness and aggressiveness. In this day of competition of industry against industry, no single producer can hope to have an organization to do the work necessary for the mere preservation of his industry, to say nothing of keeping it apace wth competitive industries. This implies practical co-operative research and a complete knowledge of the product and all its uses.

(5) The *common good* of the lime industry demands truthfulness and frankness in facing issues hitherto avoided. For example, some lime is not suitable for finishing plaster, even though its plasticity, measured by a plasticimeter, may be high. Similarly, for every one of the manifold uses of lime, some limes serve well and others not at all. These uses of lime, and the properties of the limes that serve these uses *satisfactorily*, must be accurately defined—in other words, limes must be standardized for their various uses; and neither the National Lime Association nor any individual lime manufacturer, if he has any understanding of the *common good*, shall recommend or countenance the sale of a lime which he knows, or should know, will not be satisfactory for the use intended.

(6) The *common good* of the lime industry requires that local district organizations, while they may be very desirable and helpful, shall subordinate themselves to some nation-wide authority in matters of such controversial nature as to involve the lime industry as a whole. This is no more than applying logically the law of co-operation vs. the archaic theory of individualism. But our American experience in civil government has shown that local co-operation and local self-government are very desirable so long as they do not conflict with matters of truly national policy.

(7) The *common good* of the lime industry demands the development of a sense of responsibility on the part of every lime manufacturer. For so long as a man is an active producer of lime he cannot unburden *his own* shoulders by heaping his rightful share of the load on some other lime manufacturer. His share of the burden of responsibility is his as long as he is a lime manufacturer.

(8) The *common good* of the lime industry demands that every lime manufacturer publicly and openly assume his share of responsibility for the condition of the lime industry; and the only way he can do this is to join with his fellow lime manufacturers in an attempt to improve the condition, if he wants it improved; if he does not do so, he has no right now, or at any future time, to complain of conditions as he may find them.

(9) The *common good* of the lime industry requires that every manufacturer in times of curtailed demand restrict his production to such as actually yields him a fair profit. It is unlawful and against public policy for lime manufacturers to restrict production by agreement or collusion; but it is not unlawful and it is for public policy for every lime manufacturer voluntarily to decide to obey the first law of successful business—either to sell at a profit or not to sell at all. A big operator with heavy fixed charges may consider it good business to

operate for payment of the fixed charges only; but he is at the mercy of the small operator with little or no fixed charges who can operate for *day wages only;* therefore the big operator is often nearer "the bottomless pit" than his smaller competitor, and has no reason to consider himself exempt from this obligation.

(10) The *common good* of the lime industry (and other basic industries as well) requires that an effective means be found to prevent the erection of *unnecessary* new plants. The most logical way to do this, it would seem, is through co-operation with reputable machinery manufacturers to convince them that *bona fide* going concerns are more desirable customers than prospective new producers, and that it is unethical and poor business to finance prospective new producers with long terms of credit. Such a course does not imply that new and efficient plants should not be built to replace old and inefficient ones; but machinery manufacturers, for their own good, should co-operate with each other and with substantial and responsible lime manufacturers to prevent abuse of credit by irresponsible promoters. A strongly organized lime industry can go a long way toward the attainment of this goal.

A Suggested Plan of Organization

Believing that one of the greatest shortcomings of the lime industry is a lack of sense of individual responsibility for the promotion of common good in a common industry, we respectfully suggest consideration of a national organization somewhat upon the following lines:

The elective officers shall consist of a president, vice-president, treasurer and eight directors. Their terms of office shall be for one year.

The chairman of the board of directors shall be the president, ex-officio.

Directors shall be elected because of their special qualifications for the duties herein described rather than to represent geographical districts.

Each director, ex-officio, shall be the chairman of a committee of six other members, whom he shall appoint by and with the consent of the president. No member shall serve on two committees at the same time.

These committees shall be known as:

(1) Committee on finance.
(2) Committee on membership.
(3) Committee on trade practices.
(4) Committee on publicity.
(5) Committee on research.
(6) Committee on production.
(7) Committee on standard cost-keeping.
(8) Committee on specifications for lime products.

The president, by and with the consent of the board of directors, shall appoint a qualified secretary-general manager, and two assistant secretaries.

The secretary-general manager shall be the secretary for the board of directors and for the committees on finance and on specifications for lime products.

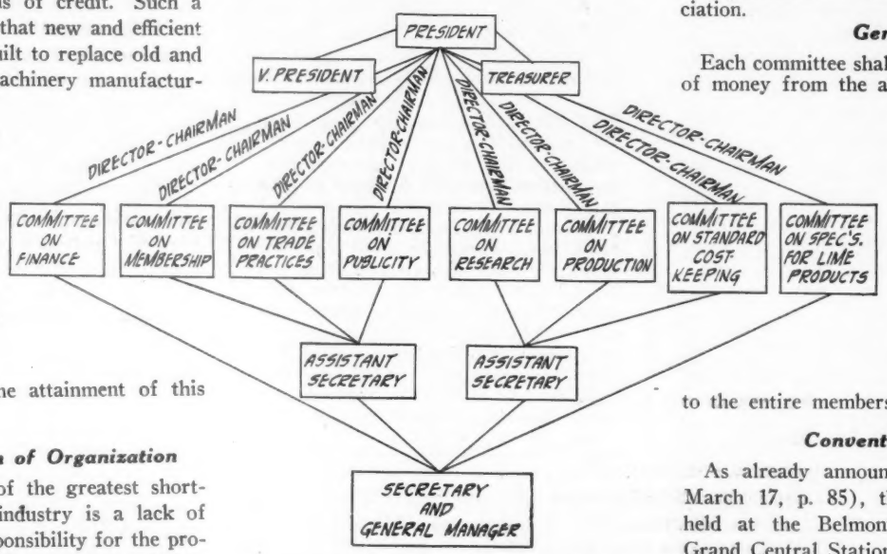
One assistant secretary shall be the secretary for the committee on membership, trade practices and publicity.

One assistant secretary, who should be an engineer, chemist, or technical man, shall be secretary for the committee on research, production and cost-keeping.

Duties of the Committees

Each committee shall meet at least quarterly at some place that may be decided upon as most suitable or convenient to its members. Four members shall constitute a quorum.

(1) The finance committee shall study financial needs of the association and recommend ways and means for meeting them to the board of directors of the association.



Proposed scheme of organization for National Lime Association

The finance committee, subject to the approval of the board of directors, shall draw up an annual budget and shall apportion the amount of money to be spent under the direction of the various committees, for purposes to be described.

(2) The committee on membership shall determine the eligibility of lime manufacturers for membership and shall recommend or otherwise dispose of applications for membership, to the board of directors, which shall act upon such recommendations. The committee on membership shall recommend ways and means of interesting non-members in membership, and for maintaining the interest of members in the association.

(3) The committee on trade practices shall inquire into the relations of lime manufacturers with distributing agencies, territorial problems, freight rates, trade discounts, etc., etc., and shall make recommendations for an equitable settlement of such problems, or on a code of ethics, to the board of directors, or to the members in convention assembled.

(4) The committee on publicity shall study and deal with all matters relating to publicity and advertising which affect the welfare of the lime industry.

(5) The committee on research shall determine what lines of research work it is desirable for the lime industry as a whole to undertake, and so far as possible assemble and co-ordinate the results of all other research work done on lime and lime products. When research work is undertaken by the association it shall be under the supervision of this committee.

(6) The committee on production shall study production or manufacturing methods for the purpose of finding out and recommending practices which are proved to be most efficient and economical.

(7) The committee on standard cost-keeping shall study costs and cost-keeping and recommend a standard system to be adopted in whole or in essentials by all members.

(8) The committee on specifications for lime products shall study and recommend standard specifications for lime products which shall be recognized by the association, and recognition of which shall ultimately be a requirement for membership in the association.

General

Each committee shall be apportioned a sum of money from the annual budget to spend at its discretion—to employ outside experts part time or whole time if necessary for professional advice or service.

Each committee shall report annually, through its chairman, to the board of directors, who shall make such a composite report as shall be deemed desirable, to the entire membership of the association.

Convention Plans

As already announced (Rock Products, March 17, p. 85), the convention will be held at the Belmont Hotel, opposite the Grand Central Station, on 42nd Street, New York City, on May 23 and 24. There will be no set program. The whole intent of the convention is to draw together the best minds in the American lime industry for a free and frank discussion of present problems and conditions and to consider ways and means to better conditions. S. W. Stauffer, sales manager of the J. E. Baker Co., York, Penn., will be chairman.

The principal speaker on May 24 will be Charles F. Abbott, executive director of the American Institute of Steel Construction, Inc., and his subject will be "A Million Times Nothing." It will be a most suggestive and stirring discussion of the problems of organized industry and will contain many useful ideas to help in the solution of the problems of the lime industry.

The American Institute of Steel Construction, which Mr. Abbott manages, has 218 member plants which produce approximately 90% of the structural steel turned out on both sides of the United States-Canadian border, excluding the product of the plants controlled by the rolling mills.

Prior to his association with the American Institute of Steel Construction, Inc., Mr. Abbott was connected with the National

Analine and Chemical Corp. as director of commercial research in charge of sales organization activities.

His business experience also includes a number of years as assistant general manager in charge of sales, the Art Metal Construction Co., Jamestown, N. Y., and as director of sales, Celluloid Co., New York City.

Mr. Abbott was one of the organizers of the American Society of Sales Executives and the New York Sales Managers' Club. He has served as president of both organization and as a member of committees in touch with advertising club activities.

Among the organizations which Mr. Abbott has addressed during the last year or so are the following: American Institute of the City of New York, New York, N. Y.; Iron, Steel and Allied Industries Conference, Del Monte, Calif.; St. Louis Chamber of Commerce, St. Louis, Mo.; Advertising Club of Seattle, Seattle, Wash.; American Steel and Heavy Hardware Association, Cleveland, Ohio; Convention of Associated Business Papers, Chicago, Ill.; Boston Sales Managers' Club, Boston, Mass.; New York Sales Managers' Club, New York, N. Y.; Concrete Reinforcing Institute, White Sulphur Springs, W. Va.; Annual Conference, Babson's Statistical Organization, Wellesley Hills, Mass.; Pacific Northwest Iron and Steel Conference, Tacoma, Wash.

Much Interest in the Convention

Many progressive lime manufacturers have already assured the convention committee of their intention to attend. The sessions will be open to all lime manufacturers, whether present members of the National Lime Association or not.

On Wednesday evening, May 23, there will be the usual dinner and enterainment given by the Valve Bag Co., Toledo, Ohio, to the National Lime Association and its guests.

Rock Products has conducted a considerable correspondence with lime manufacturers throughout the country in connection with the problems of the lime industry and the coming convention. In reply a great many letters have been received from lime manufacturers containing both praise and criticism of our efforts. It has been impossible, as yet, to reply to many of these correspondents individually, but we take this occasion to thank them one and all. From their letters, whatever useful there may be in the foregoing outline, was derived. There is yet much to be digested and considered.

Rock Products' only desire is to be helpful to the industries which it serves to the limit of its capacity to serve. To take the initiative in such a case naturally calls forth criticism as well as praise; and we are frank to say the criticism is more helpful and just as welcome. The first publisher and editor of Rock Products had much to do with the establishment of the first National Lime Manufacturers' Association. If the present publisher and editor have made any helpful contribution to its maintenance they are more than satisfied. It is only to be hoped that we have presented the case to the lime industry sufficiently forcefully to induce every live lime manufacturer in the United States to attend the New York convention, there to contribute his bit; and may its outcome bring prosperity to all!

Charles F. Abbott
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Too Big!

WORSHIPPERS at the shrine of bigness in business are beginning to doubt, it is asserted by Alvin E. Dodd, manager of the Department of Domestic Distribution of the Chamber of Commerce of the United States, in an address before the Cincinnati Advertising Club. They are discovering that bigness and efficiency do not always go hand in hand.

"The struggle for great volume," said Mr. Dodd, "has been carried on with too little regard to the cost of getting the business. The over-extension of trade territory and sales effort, the multiplication of varieties and the attempts to meet the requirements of too wide a range of customers, all with the purpose of building a bigger business, have resulted in many cases in the piling up of expenses and an increase in the number of red ink items on the unfavorable side of the business ledger.

"The most hopeful sign on the business horizon is the rapid decrease in the worshippers of mere size." The American business man is beginning to weigh the costs of increased volume against the profits. He has found that oftentimes the smaller business will pay the larger profits. We have examples that prove conclusively the advantage of reducing instead of increasing the number of customers, shortening the trade radius and cutting down the number of varieties. Efficiency rather than volume is beginning to be the accepted standard."

U. S. Gypsum to Build Three Plants

DIRECTORS of the U. S. Gypsum Co. of Chicago at their meeting on May 9 authorized the early construction of three new gypsum plants, in accordance with plans that have been under analysis for some time. One of these plants will be located in Chicago, one in Detroit and the third at Philadelphia.

The Philadelphia plant will be built on land owned by the company and it will receive gypsum from Nova Scotia brought by the company's own ships. The Detroit and Chicago plants will receive gypsum by lake steamers from Alabaster, Mich., on the shores of Lake Huron, where developments for this purpose are already under way.—*Chicago* (Ill.) *American.*

Lagarde Lime Company Property Sold

A DEED filed in the probate office at Gadsden, Ala., recently revealed the sale of the large properties of the Lagarde Lime and Stone Co., a Pennsylvania corporation with headquarters at Allentown.

The purchaser paid $36,595.06 cash and other valuable considerations for the 244½ acres of land, the lime quarries and machinery.—*Birmingham* (Ala.) *News.*

New Lime and Stone Plant for Akron, Ohio

A LIME and stone plant to cost $75,000 will be constructed at Akron, Ohio, according to reports. The plant will be a subsidiary of the National Lime and Stone Co., Findley, Ohio, which has quarries throughout eastern Ohio. Stone will be shipped to Akron for manufacture into lime. —*Akron* (Ohio) *Times-Press.*

City Plans Concrete Tests

TESTS of sand and gravel mixture for use in making reinforced concrete for building purposes are to be made in the Portland, Ore., city laboratories to determine the comparative strength of fine sand and coarse sand to be used in securing stronger concrete, according to reports of city officials.—*Portland* (Ore.) *Journal of Commerce.*

Safety is Theme at Three More Regional Cement Meetings

At La Salle, Illinois; Kansas City, Missouri; Des Moines, Iowa

MANUFACTURERS of portland cement represented in the membership of the Portland Cement Association held three more regional safety meetings during the latter half of April and on the first day of May. One hundred fifty-nine mill-operating men registered at the meeting at La Salle, Ill., on April 19; 108 registered at the Kansas City meeting, in co-operation with the Central States Safety Congress on April 24; and 28 were present at a similar meeting in Des Moines, May 1. The size and quality of these meetings furnishes evidence of the speed with which interest in accident prevention is gaining ground throughout the industry.

Big Gathering at La Salle

Thursday, April 19, was a red letter day for the cement industry around La Salle, Ill., on the occasion of the annual safety conference of the Illinois mills in that city. The registered attendance was considerably greater than at any previous meeting of the kind ever held by the local mills. Those represented were the Alpha Portland Cement Co.'s mills at La Salle and St. Louis; mills of the Lehigh and Marquette companies at La Salle and of the latter company at Cape Girardeau, Mo.; those of the Missouri Portland Cement Co. at St. Louis and the Sandusky Cement Co. at Dixon, Ill.

Throughout almost the entire meeting attention was focused upon the increased responsibilities and opportunities of foremen and department heads in perfecting safety and other phases of mill operation.

John J. Kelly, manager of industrial relations of the Marquette Cement Manufacturing Co., who presided at the meeting, presented Mayor Joseph Brzygot of La Salle, who made an appropriate address of welcome and remained throughout the meeting as an evidence of his interest in the prevention of mill accidents.

Other local guests who remained throughout were Dr. W. W. Greaves, surgeon of the Alpha Portland Cement Co., and Dr. John L. Rock, surgeon of the Lehigh and Marquette companies at La Salle; the superintendents of schools of La Salle, Oglesby, and Peru, Ill.; the secretary of the La Salle Chamber of Commerce; representatives of the Illinois Valley Manufacturers' Club and the Illinois Valley Foremen's Club and the Western Clock Co. of La Salle.

An unusual paper of outstanding value, on co-operation between plant surgeons and safety committees, was read by Dr. Rock. It will be reproduced in the next issue of ROCK PRODUCTS and is commended to the careful attention of every reader interested in industrial safety problems. Dr. Greaves was also an interesting speaker at the meeting, featuring "Safety Work from the Plant Surgeon's Viewpoint." Henry McClarnan, general superintendent of the Alpha company at La Salle, presided at the luncheon, and John Young, superintendent of the Lehigh mill at Oglesby, served as toastmaster at the dinner. The meeting was one of the most effective of its kind held anywhere to date.

Dr. John R. Rock

On the following day many visiting delegates were guests of the La Salle mills for inspection trips, visiting the three local cement mills and points of historic interest in the vicinity. The registsation list follows:

Alpha Portland Cement Co., La Salle, Ill.

Henry McClarnan, general superintendent.
Jos. F. Lawniczak, chairman, safety committee.
W. W. Greaves, plant surgeon.
J. M. Franks, chief engineer.
H. H. Brewer, plant engineer.
F. B. Hamilton, chemist.
John S. Grzrybowski, physical tester.
J. W. Temm, electrical engineer.
R. K. Ginison, assistant chemist.
Walter Goodwin, Jr., electrician.
Vincent Byrne, timekeeper.
L. W. Morrow, clerk.
Steve Tomaszewski, mill foreman.
Patrick Murphy, quarry foreman.
Jos. C. Kaszynski, mill foreman.
Jos. Scoff, electric shovel engineer.
Anton Szymanski, car cleaner.
Arthur Davison, yardman.
Anton U. Buell, bag room.
Adam Kotowski, shovel engineer.
E. L. Monier, clerk.
Joseph Lenski, repairman.
George Donaldson, store clerk.
Barney Cicci, foreman.
Walter Yanks, electrical department.
Walter Menning, machine shop.
John Kopacz, burner.
Andrew Johnson, repairman.
Charles Mogai, laborer.
John Martin, shop foreman.
Frank Urbanski, machinist.
Joseph Fekol, quarry operator.
William J. Kable, operator.
Henry Rosenke, burner.
Francis Shields, repairman.
Harry L. Noel, clerk.
Joseph Live, laborer.
John Ficek, mill foreman.
F. H. Heeling, engineer.
Daniel Hall, truck driver.

Alpha Portland Cement Co., St. Louis, Mo.

F. R. Loveride, superintendent.
E. R. Kilpatrick, master mechanic.

Lehigh Portland Cement Co., Oglesby, Ill.

John Young, superintendent.
Dr. J. R. Rock, plant surgeon.
James J. Bassett, engineer.
John Allwood, safety inspector.
S. A. Kidd, chief clerk.
Steve Sitar, engineer.
Stuart Smith, chemist.
John Dusak, coal house operator.
Walter Wath, electrician.
C. J. Herrick, electrical engineer.
Adam Miller, packing-house foreman.
Louis Santerio, track foreman.
Frank Daniels, mill foreman.
V. H. Lundberg, storekeeper.
Joseph Julian, construction foreman.
Harvey Diebert, kiln room foreman.
Henry Murdock, waste-heat foreman.
Robert Kidd, machine shop foreman.
William Kidd, power house foreman.
Jess Hurst, coal clerk.
John Komator, water tender.
Leo Rose, machinist.
A. L. Carbine, repairman.
Joseph Ostrowski, chauffeur.
James Ule, laborer.
George Pioli, stock house.
Carl M. Rice, assistant chemist.
Charles Anizus, kiln room.
Frank Blanch, mill worker.
Frank Fronk, laborer.
Alfred Moechett, repairman.
Frank Kernz, repairman.
Dusan Svrobick, yard.
William Kidel, assistant chief engineer.
H. C. Ebener.
James Gallo, timekeeper.
Jacob L. Cavaletto, shipping clerk.
G. A. Hummel.

Marquette Cement Manufacturing Co., La Salle, Ill.

E. H. Alexander, foreman.
Frank Baumgardner, power engineer.
William Boehm, sheet iron worker.
Edward Bonacorn, crane operator.
C. M. Butler, chief chemist.
J. A. Confrey, mine engineer.
E. Donald, shop foreman.
William Erickson, clerk.
Angelo Fentecchio, director of music.
Charles Gedye, electrician.
V. J. Harley, assistant secretary.
R. G. Hand, storekeeper.
E. F. Healy.
A. C. Hebel, employment manager.
Henry C. Isham, loading foreman.
Gustav Johns, mill foreman.
Charles H. Jones, foreman.
Roy Killems, pipe fitter foreman.
J. J. Kelly, manager industrial relations.
Robert Kenny, mill foreman.
Reginald Kent, assistant loading foreman.
Alexander Kidd, foreman.

Robert Kidd, truck driver.
William Kimber, assistant storekeeper.
Edward Lohn, iron worker.
Hugh McCann, foreman.
James V. McGonigal, timekeeper.
John McGraw, machinist.
James P. Mennem, sack house.
Albert Moyle, truck driver.
Frank Moyle, assistant superintendent.
Ralph Moyle, general mill foreman.
Richard Moyle, Jr., loading foreman.
Richard Moyle, Sr., general superintendent.
William Moyle, assistant yard foreman.
T. Roderick Noon, chief engineer.
James Oxram, crusher foreman.
John Richardson, chief electrician.
Harold Schuetz, carpenter.
James Sicabanni, foreman.
Mike Simenc, machine shop.
Stanley W. Smith, shipping clerk.
William Spurr, foreman.
Horton Thomas, quarry repairman.
Ernest Traeger, repairman.
Clyde M. Tuttle, traffic manager.
Thomas Warkel, steel worker.
J. C. Warrmington, shop foreman.
William H. Welch, electrician.

W. W. Greaves

Marquette Cement Manufacturing Co., Cape Girardeau, Mo.
M. P. Greer, safety engineer.
R. C. Matthews, superintendent.

Missouri Portland Cement Co., St. Louis, Mo.
O. F. Schutzke, assistant superintendent.
J. Bach, foreman, kiln department.
E. H. Muth, general mill foreman.
D. B. Coleman.

Sandusky Cement Co., Dixon, Ill.
C. B. Fowler, chief chemist.
Carl A. Buchner, packing foreman.
J. E. Johnson, plant electrician.
P. H. Brookner, garage foreman.
Floyd Kitson, assistant shift foreman.
S. W. Cushing, machinist.
J. P. Peterson, storekeeper.

Portland Cement Association
A. J. R. Curtis, assistant to general manager.

Others
F. G. Arnold, reporter, La Salle *Post-Tribune*.
O. M. Benson, secretary, Illinois Valley Manufacturers' Club.
Joseph S. Brzygot, mayor, La Salle.
T. F. Halpin, Yates American Machine Co.
W. G. Hocking, Western Clock Co.
H. G. Jacobsen, Bates Valve Bag Co.
Charles Keenan, Western Clock Co.
Noah Mason, superintendent of schools, Oglesby, Ill.
T. J. McCormick, superintendent, La Salle-Peru Township high school.
W. H. Schreiner, division manager, Illinois Power and Light Co.
S. G. Seaton, chemist, Utica Hydraulic Cement Co.
H. M. Shaw, safety engineer, Illinois Power and Light Co.
A. J. Shoemaker, E. I. Du Pont de Nemours & Co.
Charles Wagner, president, Illinois Valley Foreman's Club.
F. W. Weisheit, Western Clock Co.
W. D. White, E. I. Du Pont de Nemours & Co.

Kansas City Meeting

The regional safety meeting at Kansas City, on April 24, demonstrated the rapid growth of interest in mill safety work among cement organizations of the Kansas, Oklahoma, Western Missouri region. The sessions, which were held in the Baltimore Hotel, formed a part of the Central States Safety Congress, beeting in the Baltimore and Muehlebach hotels at that time. The program presented as as follows:

Program

10:15 a.m. Meeting called to order by F. E. Tyler, president, Dewey Portland Cement Co., chairman of local committee.

Recent Safety Work in the Cement Industry. A. J. R. Curtis, secretary, committee on accident prevention, Portland Cement Association.

How to Make Safety Committees Effective. W. W. Williams, assistant to president, Employers Indemnity Co.

Remarks. H. G. Jacobsen, Chicago.

12:15 p.m. Luncheon. H. F. G. Wulf, president, Monarch Cement Co., chairman.

Address, Roye B. Hinkle, Commissioner of Labor, State of Missouri.

2:00 p.m. Afternoon session, W. P. Sabin, assistant to president, Ash Grove Lime and Portland Cement Co., presiding.

Use and Handling of Explosives. R. H. Summer, engineer, E. I. Du Pont de Nemours & Co.

Address, Isaiah Hale, safety superintendent, A. T. & S. F. Ry.

How It Feels to Win a Trophy. L. J. Wheeler (Kansas), C. A. Swigget (Lehigh).

Some Ways to Reduce Electrical Hazards. John Stewart, electric engineer, Missouri Portland Cement Co.

Better Lighting as an Aid to Plant Safety. R. D. Obermeyer, engineer, General Electric Co.

Round Table Discussion on Current Safety Problems: Guy O. Gardner (Ash Grove, Chanute), C. C. Reid (Ash Grove, Chanute), H. C. Woodward (Ash Grove, Louisville), C. M. Carman (Atlas, Independence), C. E. Caron (Consolidated, Mildred), L. J. Wheeler (Kansas), C. A. Swiggett (Lehigh, Iola), P. G. Balfour (Missouri, at Kansas City), C. P. Mitchell (Monarch), A. C. Hasse (Monarch).

W. P. Sabin

In his opening remarks Chairman Tyler stated his own great interest in accident prevention and vouched for the general enthusiasm of the executives throughout the industry. An unusual feature of the meeting was the ovation given to Louis J. Wheeler, superintendent of the Kansas Portland Cement Co. at Bonner Springs, Kan., and C. A. Swiggett, superintendent of the Lehigh Portland Cement Co. at Iola, Kan., leaders of the two mill organizations of Kansas which won Portland Cement Association trophies for operating through 1927 without a lost-time accident. Mr. Wheeler told of a hard uphill struggle with a mill which only a few years ago had many accidents; Mr. Swiggett recited the details of an organization so well trained and loyal that only one accident of note has occurred in two years. J. A. Lehaney, vice-president of the Kansas company, was roundly applauded when discovered as a proud and interested onlooker. Many telegrams, congratulatory of these organizations, were received from affiliations throughout the country.

Registration

Ash Grove Lime and Portland Cement Co., Kansas City.
W. P. Sabin, secretary.
L. Little, auditor.
H. C. McFadden, assistant auditor.

Ash Grove Lime and Portland Cement Co., Chanute, Kan.
Guy O. Gardner, local superintendent.
C. C. Reid, chief clerk.
H. R. Williams, efficiency engineer.
Harry Byers, stationary engineer.
T. M. Stone, carpenter foreman.
Ira E. Barber, draftsman.

Ash Grove Lime and Portland Cement Co., Louisville, Neb.
A. K. Frolich, construction superintendent.
H. C. Woodward, construction foreman.
E. Wheeler, construction foreman.
W. E. Goings, labor department.

Ash Grove Lime and Portland Cement Co., Ash Grove, Mo.
T. F. Culbertson, local superintendent.

Ash Grove Lime and Portland Cement Co., Galloway, Mo.
Fred McArnis, foreman.

Atlas Portland Cement Co. of Kansas, Independence, Kan.
C. M. Carman, plant manager.
Fred J. Davis, personnel director.
F. D. Harris, electrician.
T. W. Torrance, repairman.
C. N. Romine, stockroom clerk.

Consolidated Cement Corp., Mildred, Kan.
C. E. Caron, superintendent.
E. E. Harris, assistant superintendent.
E. L. Drury, chief chemist.
P. L. Patterson, master mechanic.
L. L. Brock, crane foreman.

Dewey Portland Cement Co., Kansas City, Mo.
F. E. Tyler, president.

Kansas Portland Cement Co., Kansas City, Mo.
J. A. Lehaney, vice-president.

Kansas Portland Cement Co., Bonner Springs, Kan.
L. J. Wheeler, superintendent.
N. M. De Bruin, plant engineer.
J. A. Fairchild, chief chemist.
R. L. Atkinson, mix chemist.
L. W. March, timekeeper.
C. G. Heckert, cost clerk.
J. H. Griffith, assistant chemist.
J. W. Ditto, general mill foreman.
C. W. Kurn, mill foreman.
G. P. Holmes, mill foreman.
J. Alexander, packing-house foreman.
R. W. White, carpenter foreman.
C. E. Smith, shop foreman.
Lewis P. Overton, yard foreman.
Fred Barger, storekeeper.
E. M. Clark, electrician.
N. C. Kevins, storeroom.
G. P. Davenport, electric shovel operator.
Ernest A. Dickoff, blacksmith.
Charles H. Wasson, locomotive craneman.
E. B. Perry, operator.
John W. Timgo, electrician.
L. H. Fitzpatrick, machinist.
R. W. Pine, machinist.
E. R. Willis, welder.
Ralph Lawrance, repairman.
Bert Pitman, repairman.
Homer Dunham, beltman.
Ben Mills, motor tender.
Geo. Prothero, quarryman.
W. D. Leonard, quarryman.
Carl T. Musgrove, quarryman.
K. Cornfield, packing-house.
F. R. Wasson, packing-room.
James A. Petty, mill.
J. E. Clive, truck driver.
J. M. Langston, janitor.
J. A. Jones.

John Young

Lehigh Portland Cement Co., Iola, Kan.
C. A. Swiggett, superintendent.
J. O. Myers, machine shop foreman.
M. H. Creviston, yards foreman.
Charles E. Kietzman, chief electrician.
John A. Evans.
J. B. Mayer.
Oscar McKasman.

Missouri Portland Cement Co., St. Louis, Mo.
W. E. Gorg, assistant treasurer.

Missouri Portland Cement Co., Independence, Mo.
R. F. Balfour, assistant superintendent.
J. P. McMahan, mill foreman.
F. C. Wyman, carpenter foreman.
J. W. Copeland, storekeeper.
C. E. McCormick, assistant repair foreman.

Monarch Cement Co., Humboldt, Kan.
H. F. G. Wulf, president.
C. P. Mitchell, superintendent.
P. C. Hasse, chemist.
W. J. Sinclair, Jr., timekeeper.
W. L. Hall, kiln foreman.
H. W. Radke, construction foreman.
Henry Triemer, quarry foreman.
W. C. Shaffer, master mechanic.
M. E. Stephenson, chief electrician.

Portland Cement Association
A. J. R. Curtis, assistant to general manager, Chicago.

State Officials
B. B. Hinkle, state commissioner of labor, Jefferson City, Mo.
B. G. Baird, state factory inspector, Topeka, Kan.
George H. Cramer, state factory inspector, Topeka, Kan.

Others
E. M. Cowpland, Hercules Powder Co.
W. O. Edmonds, Kansas City Power and Light Co.
G. L. Gore, safety engineer, Bruce Dodson & Co.
Isaiah Hale, safety superintendent, A. T. & S. F. Ry.
F. W. Harper, E. I. Du Pont de Nemours & Co.
F. A. Hobble, safety inspector, A. T. & S. F. Ry.
L. A. Keck, safety manager, M. K. Gaetz Co.
R. H. Kelley, engineer, Ocean Insurance Co.
John McCullogh, Jr., Hercules Powder Co.
R. D. Obermeyer, sales manager, Edison Lamp Works.
L. C. Perry, Dixie Machinery Manufacturing Co.
R. F. Rucker, superintendent, Aluminum Ore Co.
A. G. Schroeder, safety engineer.
R. H. Summer, E. I. Du Pont de Nemours & Co.
A. R. Tillman, safety inspector, A. T. & S. F. Ry.
W. W. Williams, Employers' Indemnity Co.
R. K. Woodson, Kansas City Power and Light Co.

Initial Meeting at Des Moines

The regional safety meeting at Des Moines on Tuesday, May 1, was an initial effort in the state of Iowa, the mills of this state having been invited to the La Salle meeting on previous occasions. While several of the mills were prevented from participating because of organization changes or urgent construction work, there was a total enrollment of 28 and considerable evidence that a good start had been made.

Helmuth Krarup, superintendent of the Hawkeye mill at Des Moines, served as chairman. R. E. Hoffman, plant manager of the Atlas Portland Cement Co. at Hannibal, Mo., read a paper on "Interesting Workmen in Their Safety," which was illustrated with several dozen photographs and posters. Most of these illustrated Mr. Hoffman's idea of employing home talent for signs and posters in order to interest the greatest possible number of the men by giving each something to do.

Gordon C. Huth, supervisor of safety and labor of the Universal Portland Cement Co. at the Duluth plant, who has led his large organization through two successful contests for the Portland Cement Association trophy, read an interesting paper on mill safety organization which we hope may appear in an early number of ROCK PRODUCTS. The Duluth mill has had one accident in two years. It recently operated 700 days, with approximately 2,000,000 man-hours of labor, without a mishap sufficient to keep any workman away from his usual duties.

C. B. Condon, secretary and general manager of the Hawkeye Portland Cement Co., acted as toastmaster at the dinner, and Hon. A. L. Urick, state commissioner of labor for the past 15 years, made the dinner address. Among others who participated in the discussion of current safety problems were Oscar C. Davis, superintendent of the Lehigh mill at Mason City; Conrad C. Miller, vice-president of the Pyramid Portland Cement Co., Des Moines, and George B. Winn, safety engineer of the Pyramid and Pennsylvania-Dixie companies. O. B. Monahan, engineer, E. I. Du Pont de Nemours & Co., assisted with a valuable paper on care in the handling and use of explosives.

Registration

Atlas Portland Cement Co., Hannibal, Mo.
R. E. Hoffman, plant manager.

Hawkeye Portland Cement Co., Des Moines, Ia.
C. B. Condon, secretary and general manager.
Helmuth Krarup, superintendent.
J. C. Bennett, assistant superintendent.
Jas. V. Mandia, supervising chemist.
E. A. Hawley, chief engineer.
Cloyd Thornsberry, chief electrician.
D. C. Prahaska, quarry foreman.
W. W. Creighton, general mill foreman.
A. H. Gilbert, repair foreman.
Harry Rudasill, machine foreman.

Lehigh Portland Cement Co., Mason City, Ia.
Oscar Davis, superintendent.
W. H. Patterson, plant engineer.
Bert Lindstrom, blacksmith.
E. S. Hopkins, foreman.

Pyramid Portland Cement Co., Des Moines, Ia.
Conrad C. Miller, vice-president.
J. H. Dalbey.
H. G. Loeffler, superintendent.
Geo. B. Winn, director of safety.

Universal Portland Cement Co., Duluth, Minn.
G. C. Huth, supervisor of safety and labor.

Portland Cement Association
A. J. R. Cutris, assistant to general manager.

Department of Labor, State of Iowa
A. L. Urick, commissioner of labor.
J. D. Seaman, deputy commissioner of labor.
F. T. Crockett, state factory inspector.
Ellen M. Romke, state factory inspector.

Others
H. G. Jacobsen, Bates Valve Bag Co., Chicago.
O. B. Monahan, E. I. Du Pont de Nemours and Co.
W. D. Ryan, local engineer, U. S. Bureau of Mines.

Future Meetings

Further regional safety meetings have been announced by the Portland Cement Association as follows:

Easton, Penn.—Hotel Easton, Friday, May 25; R. B. Fortuin, chairman.

Indianapolis, Ind.—Indianapolis Athletic Club, Tuesday, June 5; D. S. MacBride, chairman.

Albany, N. Y.—Hotel Ten Eyck, Tuesday, June 12; John J. Porter, chairman.

Washington, D. C.—Friday, June 15.

Pittsburgh, Penn.—William Penn Hotel, Tuesday, June 19.

San Francisco, Calif.—Tuesday, October 2; W. H. George, chairman.

The Easton meeting, to be held on May 25, was previously announced for Phillipsburg, N. J., on May 24.

Davison Chemical Co. Acquires Florida Phosphate Rock Property

THE Davison Chemical Co., Baltimore, has purchased through Hayden, Stone & Co. 160,000 shares of stock out of 239,754 shares outstanding of the Southern Phosphate Corp., the deal involving about $1,526,000. C. Wilbur Miller, president of the Davison company, announced that the acquisition entailed no increase in the capitalization or any kind of financing by the Davison company. This purchase gives the Baltimore company control of one of the largest deposits of phosphate rock in Florida and, in connection with the alliance previously made with the Rio Tinto Co. for its supply of raw pyrites, completes its protection for all of its raw materials.

The Southern Phosphate Corp. last year produced more than 250,000 tons of phosphate rock. The property is said to contain 23,000,000 tons of the material.

Texas Not to Build State Cement Plant Now

NO FUNDS are available for any department of state government to establish a state-owned cement factory, it was said recently by R. B. Walthall, chairman of the Texas State Board of Control, after receiving many letters from machinery supply houses seeking contracts to equip the Texas factory which they said soon was to be built.

Chairman Walthall said the legislature merely adopted a resolution directing an investigation as to the feasibility of establishing a cement plant and the Board of Control will report to the 41st legislature. It is now making an investigation of the facts.—*Dallas* (Tex.) *News.*

Court Restrains Filing of Cement Agreement

THE Wilmington Chancery Court has refused to restrain the North American Cement Corp.'s stockholders meeting, at which a proposed merger with the Pennsylvania-Dixie Cement Corp. is to be voted upon.

The court, however, issued an order restraining the board of directors of the North American Cement Corp. from filing with the secretary of state of Delaware a merger agreement if it is approved by stockholders. A hearing will be held May 25.

The case, McFarland vs. the North American Cement Corp., was brought to secure an injunction to enjoin the North American Cement Corp. from merging with the Pennsylvania-Dixie Cement Corp.—*Brooklyn* (N. Y.) *Eagle.*

The stockholders of the North American Cement Corp. have approved the recommendation of directors to consolidate with the Pennsylvania-Dixie Cement Corp. The new company will be known as the General Cement Corp.

Longest Concrete Highway

THE longest continuous concrete highway in the United States is in Georgia, according to the *Georgia Highway Magazine.* It extends from West Point on the Alabama line to Scheconnée on the Bibb-Houston county line, 195 miles. The Minnesota highway between White Bear and Duluth, 137 miles, has previously been rated the longest in the country.

Annual Banquet of the St. Louis Quarrymen's Association

THE annual banquet of the St. Louis Quarrymen's Association was held at the Jefferson Hotel, St. Louis, Mo., on Friday evening, April 20. Over 80 representatives were present, including several engineers from the city hall, a number of engineers and street commissioners from nearby Missouri counties and suburban cities, and also several engineers from Illinois cities across the Mississippi River. The National Crushed Stone Association was represented by President Otho M. Graves, A. T. Goldbeck, director of the bureau of engineering, and J. R. Boyd, secretary.

Immediately after the conclusion of the dinner the ceremonies were formally opened by William Eyermann, president of the St. Louis association. Col. E. J. McMahon, executive secretary of the association, acted as toastmaster. Speakers of the evening were: John H. Brod, director of public safety of the city of St. Louis; Judge James F. Gardner, St. Louis county court; Otho M. Graves and A. T. Goldbeck. Others seated at the speakers' table included W. W. Horner, city engineer, St. Louis; Roy Jablonsky, county engineer, St. Louis county; W. F. Wise, president, Southwestern Division, National Crushed Stone Association; J. R. Boyd, and N. C. Rockwood, editor, ROCK PRODUCTS.

Preceding the annual banquet there was held a business meeting of the association at which Mr. Eyermann presided. Short talks were made by Mr. Graves and Mr. Boyd. Mr. Graves outlined briefly the work which the association is engaged in, with particular stress upon the new research laboratory recently established by the association. Mr. Boyd urgently requested the cooperation of all present in bringing into the National Association all quarry operators in the St. Louis territory who were not already members.

The following quarries participated in the meeting and banquet:

Bambrick Brothers Construction Co., Big Ben Quarry Co., T. E. Cavanaugh, Columbia Quarry Co., Electric Limestone Co., Eyermann Construction Co., Fehlig Construction Co., Hoffmann Brothers Construction Co., Mutual Quarry Co., Pilot Knob Ore Co., Rock Hill Quarry and Construction Co., James Rothwell, Steffan and Brothers, Casper Stolle Quarry and Construction Co., Tower Grove Quarry and Construction Co., Union Quarry and Construction Co.—*Crushed Stone Journal* (April, 1928).

Pioneer Quarryman Dies

FREDERICK AUGUSTUS BECKWITH, first vice-president of the Kelley Island Lime and Transport Co., died recently at the age of 77 years, in Coronado, Calif. Mr. Beckwith had been with the lime company for 30 years and prior to that time was president of the Lakeside and Marblehead railroad, a subsidiary, for 10 years.

Joseph E. Gray Joins Staff of National Crushed Stone Association

IT IS WITH PLEASURE that the National Crushed Stone Association announces the addition to its headquarters staff of Joseph E. Gray, who will occupy the position of laboratory engineer in the new research testing laboratory.

Mr. Gray received his preliminary training in scientific research and laboratory technique in the textile section of the U. S. Bureau of Standards, where he was employed from 1921 to 1924.

Joseph E. Gray

At the close of 1924 he accepted a position in the physical testing laboratory of the U. S. Bureau of Public Roads.

Mr. Gray's experience with the Bureau of Public Roads has been unusually diversified, thus giving him an exceptional opportunity to familiarize himself with practically every phase of highway construction.

In addition to the testing of non-bituminous road materials and concrete while in the Division of Tests, he has also served as a junior highway engineer in the Division of Construction and the Division of Control.

Mr. Gray was born in Washington, D. C., January 8, 1902, and received his engineering education at George Washington University, from which he was graduated with the degree of bachelor of science in civil engineering.

In addition to Mr. Gray, there have been obtained to complete the laboratory personnel, Thomas P. Herrell at laboratory assistant and William B. Brown as laboratory helper. Mr. Terrell for the past six years has been engaged in the Division of Tests of the U. S. Bureau of Public Roads.—*The Crushed Stone Journal.*

Fort Scott Cement Company Making Improvements

THE Fort Scott Hydraulic Cement Co. has moved all its activities to its plant north of Fort Scott, Kan., and will hereafter keep the plant at Third and Clark streets for emergency purposes.

New and expensive machinery, which will greatly increase the capacity of the north plant, has been bought and is being installed.

The move has been planned by Howard Thomas, president of the company, for some time past and among the preparatory steps taken has been the building of houses for the employes near the north plant.

The move to the north plant is being made because of the realization that centralization of the company's activities will contribute both to efficiency and economy.—*Fort Scott* (Kan.) *Tribune.*

U. S. Gypsum Aquires Modern Montana Gypsum Plant

THE property of the Northwest Gypsum Products Co., in the vicinity of Heath, Mont., was recently transferred to the United States Gypsum Co., who for several years have owned a tract of land adjoining that of the Northwest company.

The Northwest Gypsum Products Co. began the construction of its plaster mill, near Heath, in the spring of 1921 and started manufacturing operations January 1, 1922, producing stucco and tile.

The main entry to the mine is at the crest of an anticline and there is only an elevation of 6-in. from the adit to the face of the main entry, in some 700 ft. The cross entries lie at right angles to the main entry. The mine is ventilated by air shafts. Horses are used for tramming the rock to the crushers. The mine has a good roof, requiring very little timbering. The room and pillar system is employed. Scranton electric drills are used.

The mill buildings are constructed in the shape of a letter L. A Gates gyratory crusher and four-roller Raymond mills are employed. The mill is equipped with an 8x50-ft. Allis-Chalmers dryer, but the rock coming from the mine is sufficient dry to not require drying. For calcining, two 9½x 10-ft. kettles are employed. For the drying of the gypsum tile, either the mechanical oil-burning dryer is used or the blocks are taken to open-air racks. As Montana weather is usually very dry, the blocks frequently dry in 90 hours.

The plant obtains its power over its own transmission line from a sub-station of the Montana Power Co. Water for manufacturing use is pumped from a nearby creek and stored in tanks. Coal is used for the calcining process, although the plant is equipped for oil burning.

In addition to the regular plant buildings the company maintains a bath house with showers, a boarding house, and cottages for its employes.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Apr. 7	Limestone Flux Week ended Apr. 14	Sand, Stone and Gravel Week ended Apr. 7	Sand, Stone and Gravel Week ended Apr. 14
Eastern	2,633	2,873	5,501	7,619
Allegheny	3,220	3,279	5,413	5,901
Pocahontas	418	433	906	942
Southern	572	554	11,367	10,345
Northwestern	884	956	4,452	4,788
Central Western	343	409	6,910	7,819
Southwestern	357	455	5,520	5,483
Total	8,427	8,959	40,069	42,897

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

District	Limestone Flux 1927 Period to Date Apr. 16	Limestone Flux 1928 Period to Date Apr. 14	Sand, Gravel and Stone 1927 Period to Date Apr. 16	Sand, Gravel and Stone 1928 Period to Date Apr. 14
Eastern	36,890	30,072	43,789	41,306
Allegheny	48,512	42,802	55,520	44,356
Pocahontas	3,652	3,836	6,856	8,688
Southern	7,342	7,870	150,230	134,390
Northwestern	15,010	10,616	45,461	34,002
Central Western	6,276	5,940	87,832	87,444
Southwestern	4,179	5,914	62,933	68,297
Total	121,861	107,050	452,621	418,483

COMPARATIVE TOTAL LOADINGS, 1927 AND 1928

	1927	1928
Limestone flux	*121,861*	*107,050*
Sand, stone, gravel	*452,621*	*418,483*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning May 5:

SOUTHERN FREIGHT ASSOCIATION DOCKET

39723. **Crushed stone**, from Tate and Whitestone, Ga., to Texas points. It is proposed to establish through rates on crushed stone, carloads, from Tate and Whitestone, Ga., to various Texas destinations, based on Vicksburg-Shreveport combination. A statement of the proposed rates to the destinations involved will be furnished upon request.

39538. **Feldspar**, from Erwin, Tenn., Minpro and Cane Branch, N. C., to Clarion, Hawthorn and Summerville, Penn. It is proposed to revise the special rates on feldspar, carloads, minimum weight 50,000 lb., to Clarion and Hawthorn, Penn., from Erwin, Tenn., Minpro and Cane Branch, N. C., to be not higher than currently applicable to Buffalo, N. Y. Also to establish rates on the same commodity to Summerville, Penn., from the origins in question to be not higher than currently applicable to Buffalo, N. Y., in lieu of existing class rates.

39539. **Flint stone pebbles**, etc., from eastern cities to Spruce Pine, N. C. Class rates now apply, and it is proposed to establish special commodity rates on flint stone pebbles, loose or in bags, barrels or boxes; and flint stone linings (silex linings), loose or in packages, straight or mixed carloads, minimum weight 40,000 lb., from eastern cities to Spruce Pine, N. C., to be the same as currently in effect to Minpro, N. C.

39563. **Granite, marble and stone**, from Berkeley, Elberton, Ethridge and Oglesby, Ga., to Monticello, Ill. Lowest combination now applies, and it is proposed to establish the following commodity rates on granite, marble and stone, carloads, as described in S. A. L. Ry. I. C. C. A7176—from and to the above mentioned points: Descriptions 1 and 2, 936c; Descriptions 4 and 5, 553c per ton, same as rates in effect to points in the vicinity of Monticello, Ill.

39571. **Silica**, from Apison, Tenn., to Sebring, Ohio. Combination now applies. Proposed rate on silica (sandstone and clay mixture), ground or pulverized, carloads, minimum weight 60,000 lb.—from Apison, Tenn., to Sebring, Ohio, 636c per net ton, made with relation to rates in effect to other points in the same territory.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

39599. **Lime**, from Zirkle, Va., to Philadelphia, Penn. Present rate, 297c per net ton (combination). Proposed rates from and to points mentioned: Agricultural and chemical lime, carloads, minimum weight 30,000 lb., 227c per net ton; building lime, carloads, minimum weight, 30,000 lb., 230c per net ton. The suggested rate on agricultural and chemical lime is the same as the rate in effect from Linville, Toms Brook and Strasburg, Va.; on building lime, same as the rate from Strasburg Junction to Philadelphia.

39626. **Whiting and whiting substitute**, from eastern points to Atlanta, Ga., group, Chattanooga, Tenn., group and Birmingham, Ala., group. It is proposed to establish the following rail and water rates (to include marine insurance) on Whiting and Whiting Substitute (recarbonated lime waste), in straight or mixed carloads, minimum weight 40,000 lb.; to Atlanta, Ga., and group and Chattanooga, Tenn., and group, from Boston, Mass., and Providence, R. I., 51c; New York, N. Y., 48c per 100 lb. Same as the present rates on whiting, carloads, minimum weight 40,000 lb.; to Birmingham, Ala., and group, from Boston and Providence, 54c; from New York, N. Y., 51c per 100 lb., 3c over the suggested rates to Atlanta, Ga.

CENTRAL FREIGHT ASSOCIATION DOCKET

18099. To establish rate on **sand, molding, glass**, etc., on basis of 90c per net ton over Chicago, Ill., rate from Brazil, Ehrmandale, Patoka and Seelyville, Ind., to Harvard, Ill. The present rates from Brazil, Ehrmandale and Patoka, Ind., are made by a combination of 190c to Chicago, Ill., and 90c beyond, while the rate from Seelyville, Ind., is based on the sixth class rate.

18109. To establish on **crushed stone and crushed stone screenings**, carloads, Lima, Ohio, rate of 95c per net ton to Ridgeville, Ind., and 105c per net ton to Winchester and Lynn, Ind. Present rates, sixth class. Route—Via N. Y. C. & St. L. R. R., Portland, Ind., and P. R. R.

18119. To establish rate of 85c per net ton on **crushed stone**, in bulk, in open top cars only, carloads, also **agricultural limestone (not ground or pulverized)**, in bulk, in open top cars only, carloads, Chicago, Ill., and points taking same rates, as shown in C. F. A. T. B. Tariff 197J to stations on the Grand Trunk Ry., Lottaville, Ind., to Valparaiso, Ind., inclusive. Present rates, 92c per net ton. No change to be made in present rate of 77c per net ton from Gary, McCook and Thornton, Ill., as shown in explanation of circle reference mark 85 on page 16 of the aforesaid tariff.

18120. To establish on **gravel and sand**, other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Follansbee, W. Va., rate of 60c per net ton. Present rate, 70c per net ton.

18122. To establish on **stone dust**, carloads, Piqua, Ohio, to Findlay, Chase, Murphy, McComb, Deweyville and Hancock, Ohio, rate of $1.26 per net ton. Present rate, $1.39 per net ton.

18124. To establish on **crushed stone and screenings**, carloads, Cleveland, Ohio, to Ohio, rates as shown below:

To	*Prop.	†Pres.	To	*Prop.	†Pres.
Ashtabula	120	13	Marietta	160	20½
Alliance	90	13	Marion	120	16
Bayard	100	13½	Middletown	170	20½
Bellaire	140	17	Morrow	170	21
Brink Haven	120	16	Mt. Vernon	120	16½
Cadiz	140	17	New Comerstown	120	16
Cambridge	140	17	New Phila.	110	15
Cincinnati	180	21½	Niles	90	13½
Circleville	150	18½	Orrville	100	13½
Columbus	140	125	Piqua	150	19½
Coshocton	120	16	Ravenna	80	11½
Crestline	110	14	Springfield	150	18½
Dayton	160	20	Steubenville	140	17
Delaware	120	16½	Trinway	120	17
Dover	110	14½	Urbana	140	18½
E. Liverpool	120	16	Warsaw Jct.	120	16
Killbuck	110	15	Wooster	100	14
Lima	140	18	Xenia	160	20
London	150	18½	Youngstown	100	13½
Londonville	110	15	Zanesville	140	19
Macedonia	70	‡80			

*In cents per ton of 2000 lb.
†In cents per 100 lb., 6th class, except as noted.
‡In cents per ton of 2000 lb., intermediate to Akron.

18132. To establish on **crushed stone**, carloads, Kenneth and Kokomo, Ind., and Middleport, Ohio, following rates to Indiana points, per net ton:

From Kenneth, Ind.

To	Prop.	Pres.	To	Prop.	Pres.
Monroe	110	$1.27	Winchester	100	1.27
Berne	105	1.27	Woods	100	1.27
Geneva	105	1.27	Snow Hill	100	1.27
Briant	105	1.27	Lynn	105	1.27
Portland	100	1.27	Fountain City	105	1.27

From Middleport, Ohio

To	Prop.	Pres.*	To	Prop.	Pres.*
Monroe	90	$2.70	Winchester	105	2.90
Berne	90	2.60	Woods	105	3.00
Geneva	95	2.70	Snow Hill	105	3.00
Briant	95	2.70	Lynn	105	3.00
Portland	100	2.70	Fountain City	115	3.20

From Kokomo, Ind.

To	Prop.	Pres.*	To	Prop.	Pres.*
Winchester	100	$3.20	Lynn	105	3.20
Woods	105	3.20	Fountain City	105	3.30
Snow Hill	105	3.20			

*Sixth class.

18134. To establish on **crushed stone**, carloads, Woodville, Ohio, to Delta and Wauseon, Ohio, via Toledo & Indiana R. R., rate of 80c and 85c per net ton, respectively. Present rate, 90c per net ton.

18140. To establish on **gravel and sand**, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Columbus, Ind., to Madison, Ind., rate of 75c per net ton. Present rate, 85c per net ton.

18141. To establish on **sand and gravel**, carloads, Gosport, Ind., to Fillmore, Ind., rate of 80c per net ton. Route—Via C. I. & L. Ry., Limedale and Penna. R. R. Present rate, sixth class.

18143. To establish on **crushed stone**, carloads, Mitchell, Ind., to Orleans and Lost River, Ind., rate of 55c per net ton. Present rate, 58c to Orleans, Ind., and 60c per net ton to Lost River, Ind.

18250. To establish on **stone dust**, carloads, Piqua, Ohio, to Snowhill and Winchester, Ind., via Penna. R. R., rate of $1.14 per net ton. Present rate, $1.64 per net ton.

18251. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grind-

ing or polishing, loam, molding or silica) and gravel, carloads, Noblesville, Ind., to Eagletown, Jolietville, Rosston, Gadsden and Heath, Ind., rate of 60c per net ton. Present rates:

C. I. Ry. Tariff 874
I. R. C. 682
I. C. C. 580

From Noblesville, Ind.,to—	
Eagletown, Ind.	65c
Jolietville, Ind.	65c
Rosston, Ind.	70c
Gadsden, Ind.	70c
Heath, Ind.	70c

18254. To establish following rates on **crushed stone**, carloads, to Ashland, Ohio, from Kenton, Marion, White Sulphur, Bellevue and Sandusky, Ohio. Present and proposed rates, in cents per net ton, to Ashland, Ohio:

From	Prop.	Pres.	From	Prop.	Pres.
Kenton, O.	100	80	Bellevue, O.	95	80
Marion, O.	85	80	Sandusky, O.	100	80

18257. To advance rates on **sand and gravel**, carloads, to all points within the Gary, Ind., corporate limits to a basis not less than that in effect to Gary, proper, on traffic from Burr Oak and Ginger Hill, Ind., also Joliet, Ill. Proposed rates from Joliet, Ill., are to be restricted to the C. F. A. lines, viz.: Michigan Central R. R. and E. J. & E. Ry., and the proposed rates from Ginger Hill, Ind., are to apply for account of the N. Y. C. R. R. only. Present rates:

From Joliet, Ill., to:	Rate	Miles
*South Gary, Ind., via M. C.	50	39
East Gary, Ind., via M. C.	50	44
*Gary, Ind., via M. C.	65	49
*Ivanhoe, Ind., via E. J. & E.	50	41
*Cavanaugh, Ind., via E. J. & E.	50	42
*Gary, Ind., via E. J. & E.	65	47.1
From Ginger Hill, Ind., to:		
*Millers, Ind., via N. Y. C.	50	65
*Gary, Ind., via N. Y. C.	70	68

*Located within the corporate limits of the city of Gary, Ind.

18263. To establish on **lime**, agricultural and fluxing, having no commercial value for chemical or building purposes, carloads, minimum weight 30,000 lb., Tiffin, Ohio, to Knox and Marienville, Penn., rate of 14c. Present rate, 17c.

18266. To establish on **sand and gravel**, carloads, Cleveland, Ohio, to West View and Columbia, Ohio, rate of 60c per net ton. Present rate, 70c per net ton.

18267. To establish on **crushed stone**, carloads, East Liberty, Ohio, to Cardington, Ohio, rate of 85c per net ton. Route—Via N. Y. C. R. R., Marysville, and C. C. C. & St. L. Ry. Present rate, sixth class.

18277. To establish on **waste stone**, viz., breakwater, chip, grout, rip rap and spawls, carload, Romona, Ind., to Brookport and Golconda, Ill., via I. C. Railroad, rate of $1.50 per net ton. Present rate—$4.30 per net ton.

18278—To establish on **lime**, carload, Kenova, W. Va., to Clarion, Pa., rate of 19c. Present rate —22½c.

18279. To establish on **crushed stone**, carload, East Liberty, O., to College Corner, O., rate of $1.35 per net ton. Route—N. Y. C. R. R., Wapakoneta, O., B. & O. R. R. Present rate—sixth class.

18280. To establish on **crushed stone**, carload, East Liberty, O., to Parrott, O., rate of $1.15 per net ton. Thrifton, O., rate of $1.25 per net ton. Route—via N. Y. C., Slater, D. T. & I. R. R. Present rates—Sixth class.

18284. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica), and gravel, carload, Lake Ciecott, Ind., to points in Indiana, rates as shown below. In cents per net ton.

To	Prop.	Pres.*	To	Prop.	Pres.*
Rossville	80	260	Carmel	100	300
Frankfort	85	260	Nora	105	300
Terhune	93	270	Broad Ripple	110	300
Sheridan	98	280	Fair Grounds	110	300

*Sixth class.

18325. To establish on **crushed stone**, carloads, to Dillsboro, Ind., from Melvin, Ohio, rate of 105c per net ton and from Lima, Ohio, 135c per net ton. Present rates—16c from Melvin, Ohio, and 19½c from Lima, Ohio.

18342. To establish on **sand**, viz.: **Core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica**, carloads, Logan, Ohio, to C. F. A. territory, same commodity rates as in effect from Enterprise, Ohio, group. Present rates on Ohio intrastate traffic are those applicable under the intermediate clause carried in Hocking Valley Railway Freight Tariff Ohio No. 1372, on interstate traffic, official classification basis.

18344. To establish on **sand**, all kinds (except blast, engine, foundry, glass, molding or silica), also **gravel**, carloads, Merom, Riverton, Ind., and Palestine, Ill., to Elnora and Redford, Ind., via Illinois Central R. R., Linton and C. M. St. P. & P. R. R. rate of 93c per net ton. Present rate —104c per net ton.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

14469. **Stone, crushed**, carloads (See Note 2), from Branford (Pine Orchard) Conn., to Montville, Conn., $1.40 per net ton, via N. Y. N. H. & H. R. R., Willimantic, Conn., C. V. Ry. Reason—Proposed rate necessary to permit movement.

14482. **Stone, broken or crushed**, in open cars, carloads (See Note 2), from Westfield, Mass., to East Greenwich, R. I., $1.10 per net ton. (To expire December 31, 1928, unless sooner cancelled, changed or extended.) Reason—To provide a rate not exceeding the Westfield, Mass., to Providence rate because of the geographical location of East Greenwich, R. I.

WESTERN TRUNK LINE DOCKET

2079F. **Stone, crushed, carloads (See Note 2), but not less than 40,000 lb. Stone, rubble and rip rap**, carloads (See Note 3). In no case shall the minimum weight be less than 40,000 lb. From Lannon, Wis., to Kirkwood, Mo. Present rate, 20½c (Class E basis); proposed, 13½c per 100 lb.

SOUTHWESTERN FREIGHT BUREAU DOCKET

14693. **Lime**, from Glen Park, Mo., to interstate points. To establish the same rates on lime, carloads, minimum weight 20,000 lb., from Glen Park, Mo., to points in Kansas, Nebraska, Colorado, etc., specified under Note 10 of W. T. L. Tariff No. 78D, as is currently in effect from Mincke, Mo. At the present time there are in effect through rates on lime from Mincke, Mo., to points of destination named which are lower than the rates from Glen Park, Mo., to such destinations and shippers have requested the establishment of the same rates from Glen Park, Mo., as currently in effect from Mincke, Mo.

14725. **Lime**, from points in Alabama, Tennessee, etc., to Advance, La. To amend Item 8453 of Agent Speiden's Tariff 96D, applying on lime, carloads, from points in Alabama, Tennessee and Geogria, by adding Advance, La., as a point of destination. It is desired to establish to Advance, La., the same rates as applicable to Tremont, Ruston, Alexandria, Shreveport and other points.

14745. **Crushed stone**, from Tate and Whitestone, Ga., to Mineral Wells, Texas. To establish a rate of $5.55 per ton of 2000 lb. on crushed stone, carloads, from Tate and Whitestone, Ga., to Mineral Wells, Texas. The proposed rate is based on the Vicksburg-Shreveport combination.

Southern Cement Rates

THE Interstate Commerce Commission, on further consideration, in No. 15806, Lehigh Portland Cement Co. vs. Aberdeen and Rockfish et al. (mimeographed), and cases joined with it, the whole known as southern cement rates, has modified the findings in the original report, 132 I. C. C. 427, so as to class designated railroads as short and weak lines so as to give them the benefit of a 2 cent per 100 lb. arbitrary prescribed in that case for such lines. The cases joined with the title complaint are a sub-number, Alpha Portland Cement Co. vs. Ashland Coal and Iron; No. 15900, Security Cement and Lime Co. vs. Aberdeen and Rockfish et al., and a sub-number under the last mentioned, Tidewater Portland Cement Co. vs. Aberdeen and Rockfish.

Additional short and weak lines found, in this report, to be entitled to the short-line basis of cement rate are the following:

Alabama, Florida and Gulf; Apalachicola Northern; Atlanta and St. Andrews Bay; Atlantic and Carolina; Bonlee and Western; Cadiz Railroad; Carolina Railroad; Gainesville Midland; Georgia Southwestern and Gulf; Gulf, Mobile and Northern; Kentucky and Tennessee; Kosciusko and Southeastern; Kinston Carolina; Manistee and Ropton; Mississippi Eastern; Mississippi Export; New Orleans Great Northern; Oneida and Western; Rockcastle River; St. Marys Railroad; Statesboro Northern; Tennessee Railroad, and Tennessee Western.

I. C. C. Decisions

I. and S. 2912. Crushed Stone. Rate increase from 80 to 95 cents per ton from Gibsonburg, Maple Grove and Woodville, Ohio, to Detroit, Mich., not justified. The finding, however, was without prejudice to the Pennsylvania, the originating carrier, and such of its connections as make deliveries on that rate, increasing the rate to 85 cents per ton. The commission said the carriers had justified an increase to 85 cents.

I. and S. 2913. Sand and Gravel. The commission rules for constructing rates on sand and gravel from and to points on the Southern railway and connecting lines has found not justified, without prejudice to the filing of new schedules in conformity with the views expressed in the report, proposed restriction of combination rule in connection with rate on sand and gravel from southern points when used as factors of combination rates to interstate destinations. The suspended schedules have been ordered canceled and the proceeding has been discontinued.

The commission stated that the suspended schedules have not been justified. This finding is without prejudice to the filing of schedules establishing joint rates from Gravel Siding, Oldham and Morrison, Miss., of not more than $1.57 to Clarkdale, $1.63 to Tyronza and Marked Tree and $1.64 to Lepanto (all Arkansas cities) or a proportional rate from the producing points named to Memphis which, in combination with the rates beyond Memphis, will not under the applicable rules result in a charge to the shipper on a higher basis than that stated.

18693. Gypsum Plaster. Carload rate from Seattle, Wash., to Oregon destinations and other western states, not unreasonable, unjustly discriminatory or unduly prejudicial. Complaint ordered dismissed.

18209. Gypsum Plaster and Products. Commission should find rates and charges on plaster and plaster products in straight or mixed carloads, from Gerlach, Nev., to destinations in Washington and Oregon unduly prejudicial to the advantage of plaster plants in Montana and Utah, award reparation and prescribe a new basis of rates.

18940. Sand and gravel. An order requiring the establishment of rates on sand and gravel from Point Marion, Penn., to destinations on the Baltimore & Ohio in West Virginia, not later than January 26, has been entered, based on a finding of unreasonableness and undue prejudice against the existing rates. The commission, by division 4, found the present rates unreasonable and unduly prejudicial to the extent they exceed or may exceed those prescribed by the scale set forth in Pennsylvania Sand and Gravel Producers Association vs. Baltimore & Ohio, 104 I. C. C. 717.

19382. Sand and Gravel. Rate of $1.39 per net ton from Kenova, W. Va., to Stone, Peg, McVeigh and Hardy, Ky., found unreasonable to extent it exceeded $1.26 to Stone, Peg, McVeigh and $1.13 to Hardy.

Foreign Abstracts and Patent Review

Heat Economy of a Uniflow Cement Kiln. The author, Carl Naske, uses the term "uniflow" to designate a kiln which receives its charge of material and fuel at the same end, so that both traverse the kiln in the same direction. He finds for the conditions assumed that 34,065 kcal. become wasted in the ordinary kiln as there is no provision for their utilization. To avoid this loss of heat, there remains but one step, namely, preheating the air by means of a maximum possible amount of excess heat to a degree higher than that possible by means of the clinker heat. This can be carried to a temperature of 800° C., which corresponds to a further preheating of 800—452=348° C. The flue gases would thus be made to give up: $(800—452) \times 0.25 \times 285 = 24{,}795$ kcal.

The heat not utilized would then become: 34,056—24,795=9261 kcal.

The actual fuel consumption would be reduced to: 26.64—(24,795÷7143)=23.17 kg. per 100 kg. clinker.

The following heat balance would be obtained:

A. *Input.*

23.17×7143	=	165,503 kcal.
Exoth. reaction	=	11,400 kcal.
		176,903 kcal.

B. *Output.*

Dissociation	=	49,500 kcal.
Power	=	63,470 kcal.
Drying	=	18,000 kcal.
Loss	=	45,933 kcal.
		176,903 kcal.

The efficiency of this type of kiln would be raised to: (49,500 + 63,470 + 18,000): 176,903 = about 74%, or to two and one-half times that of a rotary kiln in its primitive condition. This efficiency can only be attained if the following conditions are satisfied:

1. Utilization of clinker heat to the extent of about 85% of the available heat.
2. Utilization of the heat of flue gases to the same extent (to preheat the air supply to still higher temperatures).
3. Utilization of the heat of flue gases for power generation.

The most recent types of clinker coolers designed by Knuettal, Stehman and others, according to the author, may utilize the waste heat for preheating the air supply, to the extent that not over 15% of it will be lost.

However, should the third condition not be fulfilled, (in the event the cement plant does not generate its own power but purchases it from other source), the *uniflow* rotary kiln becomes uneconomical and every other type of kiln, including the automatic shaft kiln, presents greater advantages, in spite of such good points in its favor as: small combustion space, high capacity, low cost of installation and most desirable concentration of operation. *Zement,* March 8, 1928.

Process for the Production of Imitation Marble Veins in Building and Other Materials. Mulliez Freres et Cie, Annappes, France (Nord). This invention has for its object a process for the production of imitation marble veins in any kind of artificial materials by means of dry or slightly moistened colored powders and consists in that one or more layers of these powders are placed or laid in the bottom of molds and the veins are marked out by forming furrows penetrating to the bottom of the molds. In the bottom of a mold is spread a first layer, of a certain thickness, of the raw product that will form the basis of the finished material, and that according to well-known processes (as for plaster), cement, etc.). This first layer is of the nature of dry powder, or else slighty moistened powder, which is of the same color as the marble ground to be imitated. Over this bottom layer are laid one or several layers of material of different colors, and always in powdered state. The color of each of these layers will correspond to the different colors of the marble veins to be reproducer. By means of an appropriate tool, or simply with the fingers, ribbed lines or furrows are traced out in the mass in such a way as to penetrate to the bottom of the mold, and representing the actual run of the veins. As a result of this the upper layer or layers fall into the bottom of the furrows that have thus been traced out, and so effect the marbling of the bottom layer. (Two claims.) *British Patent No.* 270,336.

Testing Portland Cements. M. Dugordin, writing in *Le Ciment* for March reviews the improvements made in the manufacture of cement and the design of concrete mixes. He says that the testing of portland cement has not kept pace with either of these and reviews the work of certain laboratories of high standing to show the wide differences found in the testing of portland cement and concrete. Both graphs and tables show that differences as great as 47% may be found. An interesting table shows the result of nationality in the testing of cements. Two samples tested in eight countries showed variations from 81% to 125% of the French test.

Summing up the author draws the following conclusions:

If laboratory men, working with the thermometer and balance, using a determined and calibrated sand, have some difficulty in making their tests agree, one should not be astonished to find still greater discordances in every day testing.

Also, it is prudent to examine results with attention before drawing conclusions and to take account of the following:

1. It is important that each test should include the breaking of several test pieces of the same mortar to provide an average so that an abnormal test piece may be eliminated.

2. It is necessary to make frequent checks, more especially on those results obtained for the longer periods, and to guard against drawing conclusions after 28 or 90 days from a single test that cannot be easily repeated, if the results appear doubtful.

3. It is indispensable, as given below, to make *at the same time* laboratory tests:

(*a*) On the cement alone in normal mortar following the standard strength test. These tests give the most comparable results and are the only ones which permit the builder to judge of the product furnished.

(*b*) On the concrete prepared in the laboratory with the materials and proportions of the field mix. The strength of these tests compared with the strengths obtained from test pieces made in the field work permit the engineer to judge of the field method and to know whether or not he is getting the best results from the cement.

A well made concrete with a water-cement ratio of 0.53 should give strengths of the order of 66% of the 1:3 normal mortar.

4. Finally it is elementary that in comparing cements of different brands tests should be made under identical conditions, whether in the field or in the laboratory, that is to say with the same proportions, the same aggregates and by the same operators.

American Lime Plants. The relation of German and American lime industries was described by Ing. Lange, Hohenlimburg, who gave some valuable observations on achievements of the American lime industry in certain respects in which the German industry appears to be still in its infancy. This applies to gas firing in preference to mixed fuel (or mixed feed) as practiced predominantly in Germany in burning lime and to mechanical manufacture of hydrated lime. The latter has replaced the former for structural and agricultural purposes as well as for use in concrete on road construction. It has been shown that its admixture insures a smoother and more resistant road surface. This lime product, therefore, seems able to claim considerable possibilities in the

future which have been realized in the German industry as well. Proceedings of the convention of the Association of German Lime Manufacturers, Berlin, March 2. *Tonindustrie-Zeitung,* March 21, 1928.

Tests on Fused Portland Cement and Aluminous Cement. Itsuo Yamazawa prepared fused portland cement and aluminous cement in an arc type electric furnace with an electric capacity of 35 kw. The qualities of these cements were tested and compared with those of a very finely powdered portland cement which was also tested. The results are:

	Fused portland cement	Aluminous cement	Finely powdered portland cement
Fineness			
Residue on 900-mesh	0.28%	0%	0%
Residue on 2500-mesh	0.84%	1.48%	0.68%
Residue on 4900-mesh	4.82%	3.68%	2.18%
Specific Gravity	3.08	3.09	3.17
Setting Time			
Initial	1 h. 9 min.	3 h. 7 min.	2 h. 14 min.
Final	2 h. 1 min.	4 h. 8 min.	3 h. 59 min.
Atmospheric temperature	25 deg. C	23 deg. C.	21 deg. C.
Water temperature	22 deg. C.	21.5 deg. C.	20 deg. C.
Quantity of water added	26%	26.7%	25.3%
Soundness			
Normal test	Sound	Sound	Sound
Boiling test	Sound	Sound	Sound

Tensile strength kg./sq. cm. (in wet air 24 hours thereafter in water)

	1:3		1:3		1:3	
	Neat	Mortar	Neat	Mortar	Neat	Mortar
1 day	64.5	26.8	38.8	18.0	45.8	23.3
2 days	82.5	26.5	51.3	22.4	67.1	32.8
3 days	77.0	25.3	51.5	23.0	68.0	36.3
4 days	77.3	29.5	49.8	20.0	73.1	37.3
5 days	74.8	30.0	50.8	20.5	74.0	34.2
6 days	76.5	29.0	46.3	19.8	73.8	37.0
27 days	74.8	30.0	47.0	22.9	71.2	33.8

Chemical Composition

Ignition loss			0.76
SiO_2	22.60	10.52	22.60
Al_2O_3	6.38	41.71	5.98
Fe_2O_3	4.82	8.77	3.74
CaO	63.34	38.74	63.66
MgO	0.81	0.36	0.97
SO_3	1.88	0.88	1.82
C	3.96	2.92	0
CaC_2	0.23	1.35	0
All Fe (Fe+FeO) was determined as Fe_2O_3			
	Add gypsum when grinding	Add no gypsum when grinding	Add gypsum when grinding

—*Ceramic Abstracts* (1920), 210.

The Use of Limestone for Road Building. Prof. Knapp, Darmstadt, emphasized the suitability of limestone for road construction, supporting his statements by results of scientific investigations and giving data of its use for that purpose. Successful use of limestone for road building is based on modern methods of construction. In Prof. Knapp's experience the patented Betonal process proved particularly commendable. This process consists of using crushed limestone with Betonal* mortar—similar to concrete—in a single course. An investigation of most common limestones from the chemical, physical and mineralogical standpoint has proven their suitability for road construction. Failures can generally be found to be dependent on absorption of water. Betonal excludes this possibility, as it contains colloidal silica, which imparts to it greater strength and elasticity. The investigations pointed to the Betonal process as a solution of road problems in localities where limestone is abundant. The costs involved in the process are lower than those of others. Proceedings of convention of the Association of German Lime Manufacturers, Berlin, March 2. *Tonindustrie-Zeitung,* March 21, 1928.

*"Betonal" is evidently a trade name for a sodium silicate cement hardening material used in Europe.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Light-Weight Gypsum Products. A process for increasing the bulk and decreasing the weight of gypsum products which consists in adding 2.3 parts by weight of sodium silicate solution to the gaging water for each 100 parts of calcined gypsum. The function of the silicate is shown by the reaction, $Na_2SiO_3 + CaSO_4 = Na_2SO_4 + CaSiO_3$. —*Carlisle K. Roos, M. G. Allison, assignors to United States Gypsum Co., U. S. Patent No.* 1,666,180.

Oxychloride Cement and Process of Making Same. A cement consisting of an alkaline earth chloride, magnesium oxide, and magnesium limestone, of which latter the magnesium carbonate is substantially all calcined and the calcium carbonate uncalcined. The process consists in burning blocks of magnesium limestone at a temperature above 815 deg. C. until a friable outer shell of magnesium oxide and calcium oxide, and a core of calcium carbonate and magnesium oxide, is formed. The cores are separated from the shells, ground to form a mixture of magnesium oxide and inert calcium carbonate filler for the cement. Magnesium oxide and a chloride are mixed with the comminuted product to form oxychloride cement.—*William J. McCaughey, assignor to the Cleveland Trust Co., U. S. Patent No.* 1,634,505.

Process for the Production of Refractory Magnesia Compounds. The process consists in treating dolomite in a comminuted condition with a soluble metal chloride or chlorides, or with a mixture of soluble metal chloride and a metallic oxide equivalent to the lime content of the dolomite or magnesia lime compound, drying the mass and heating it to a comparatively low temperature but sufficiently high to dehydrate the mass and expel the carbonic acid associated with the lime content, then washing out the soluble chloride and calcining the residue after filtration and drying.—*William Koehler, U. S. Patent No.* 1,664,631.

Process for Purifying and Bleaching Heavy Spar. The process consists in mixing the ground spar with about 2% or 3% manganese dioxide, treating with strong hydrochloric acid, and heating the mass sufficiently to liberate free chlorine, which acts as the bleaching agent.—*Karl Ebers, U. S. Patent No.* 1,663,159.

Process of Staining and Hardening Concrete and the Like. The process consists of treating concrete or similar materials first with a solution of one coloring reagent and then with another solution of a different coloring reagent, to obtain desired color effects. Each solution contains in addition to its coloring properties a substance capable of producing a relatively high osmotic pressure to introduce each solution deeply into the pores of the material.—*Robert B. Lammens, U. S. Patent No.* 1,666,423.

Mica-Separating Machine. The apparatus consists of a machine for splitting and separating the laminae so that the resulting flakes may be used for manufacturing mica plate and other commodities. To effect this an inclined, power-driven revolving drum, containing baffles and equipment for producing an air blast, is employed. The mica rock is introduced at one end of the drum in a partially loosened state, accomplished by bending, and caused to tumble over the baffles. The air blast aids in loosening the flakes and adds to the tumbling effect.—*Louis T. Frederick, U. S. Patent No.* 1,666,130.

Ring Oven With Revolving Hearth. The apparatus consists of a ring oven (kiln) for the treatment of pulverized or granular materials, in which the material is introduced at the changing point in the form of a thin uniform layer and sucked away, at the discharge point, with the gases. A revolving hearth, a conduit through which part of the oven gases are diverted past the discharge point, acts as a discharging means. A pressure and a suction pipe incorporated in the conduit remove the fine material and take it to a collector.—*L. Honigman, F. Bartling, U. S. Patent No.* 1,666,656.

Process of Producing Magnesium Oxide of High Grade. The method consists of adding a reagent containing magnesium chloride to a mixture of magnesium carbonate and calcium carbonate, calcining the resulting mixture, and removing water-soluble products from the calcined mixture. The magnesium chloride should preferably be slightly in excess of the equivalent of the lime content of the magnesite or dolomite rock used. It is also preferable, during calcination, to introduce a controlled amount of steam which aids in effecting the reaction. The materials should be comminuted both before and after calcination. *William Koehler, U. S. Patent No.* 1,661,043.

Rifled Section for Dredge Discharge Pipe. Two methods of giving a spiral motion to a dredge discharge, in order to spread the wear over the whole interior surface of the discharge pipe, are shown. One is an enlarged section with interior spiral fins. The other is a spiral fin to be placed at pipe joints. The inventor prefers the first method.—*N. A. Yuille, U. S. Pat.* 1,662,178.

Gypsum Building Block. A perforated gypsum building block, consisting of a great number of perforations, extending in parallel relation through the block from one face to another.—*Caleb Payne, assignor to Gypsum Engineering and Manufacturing Co., U. S. Patent No.* 1,661,009.

U. S. Gypsum Suing National Gypsum Co. for Infringement

FEDERAL JUDGE JOHN R. HAZEL at Buffalo, N. Y., on May 7 directed the National Gypsum Co. to show why a preliminary injunction restraining them from manufacturing gypsum wallboard in alleged infringement of Gustafson patent 1,665,168 should not be issued. The order was issued on complaint of the United States Gypsum Co., which that day filed suit against the National Gypsum Co.

In its bill of complaint the U. S. Gypsum Co. asks for damages resulting from the manufacture by the National Gypsum Co. of wallboard charged to infringe the Gustafson patent, and for an injunction restraining the defendant from further manufacture of this product.

The hearing on the preliminary injunction was set by Judge Hazel for June 4.—*Chicago* (Ill.) *Journal of Commerce.*

"Retreading Our Highways"

"RETREADING OUR HIGHWAYS" is the title of Bulletin No. 4 of the National Crushed Stone Association and it is by A. T. Goldbeck, director of the Bureau of Engineering. It presents a timely and practical method of salvaging macadam highways that have become difficult to travel, where the money available or the density of traffic do not justify pavements of a higher type. In this work there is a large potential market for crushed stone.

The bulletin gives approved methods and specifications for materials. It is exceptionally well printed and edited and illustrated with several photographs of the work in various stages and the finished surfaces.

Bulletin No. 5, "Comparative Tests of Crushed Stone and Gravel Concrete in New Jersey," contains the report of tests carried out by the Bureau of Public Roads and the New Jersey State Highway Commission, with a discussion by Mr. Goldbeck. These have already been published in the *National Crushed Stone Bulletin* and ROCK PRODUCTS, but many readers will be glad to have them in pamphlet form.

Utah Rock Asphalt Co. Buys Crushers

ANTICIPATING the marketing of its product in June, the Utah Rock Asphalt Co., Pueblo, Colo., has placed orders for a "Superior" jaw crusher weighing 70,000 lb. and two "Anaconda type" crushing rolls, each weighing 95,000 lb.

According to C. N. Power, president of the company, the tests recently made on this material show it to stand very high among American rock asphalts in both durability and stability.—*Colorado Springs* (Colo.) *Telegram.*

Harry Donnelly Returns to Gravel Business

HARRY DONNELLY, former president of the Ohio Gravel Ballast Co., Cincinnati, who disposed of his interests in the company two or three years ago, is back in the gravel business. He has formed a company with William Reehl of Cincinnati, which, according to Cincinnati papers, is to begin at once to construct a 100-car plant. The holdings of the company are said to include 700 acres of gravel land in the vicinity of the city. It is also reported that the company's stock ownership will include many prominent business men of Cincinnati and that retail yards will be installed to distribute the company's product in Cincinnati and its suburbs.

Harry Donnelly

Harry Donnelly is perhaps as well known in the sand and gravel industry as any man in the United States. He was brought up in the business, for his father, a pioneer in the industry, founded and managed, the Ohio Gravel Ballast Co., which was afterward controlled and operated by Harry Donnelly and his brothers. It became the largest producer in the Cincinnati district, a position which it still holds. During much of the time that he was constantly active in promoting the affairs of the National Sand and Gravel Association and he served as its president for three terms, in that way making the acquaintance of many of the producers of the country.

His associate, William Reehl, is a Cincinnati real estate man. It is expected that the new plant will be in operation about October 1. Articles of incorporation have been filed and plans are said to be ready.

North Coast Cement Buys Two Rock Carriers

SEATTLE'S cement fleet, comprising the steamships "Eastern Coast" and "Eastern Guide," will be operated between this port and View Cove, Dall Island, Southeastern Alaska, by the Pacific Coast Steamship Co., which operated for many years in the California and Alaska routes.

This corporation retired from the sea lanes in 1926, when it sold its ships to H. F. Alexander and associates. The company retained its corporate existence and this summer will return to the Southeastern Alaska route, handling freight for the recently organized Pacific Coast Cement Co., which is building a $3,000,000 plant on the East Waterway.

The "Eastern Coast" and "Eastern Guide," 6300-ton steel freighters, purchased from the Shipping Board by the Pacific Coast Steamship Co., are now in Camden, N. J., preparing for their voyages to Seattle. A. F. Marion, vice-president of the Pacific Coast Engineering Co., went east recently to accept delivery of the vessels from the Shipping Board.

The two freighters are expected to arrive in Seattle late in May. They are being reconditioned in Camden for their voyage to this coast, but the work of remodeling the freighters and equipping them as lime rock carriers will be done in Seattle.

The "Eastern Coast" and "Eastern Guide" will go into service between Seattle and View Cove late in August or early in September. They will operate in connection with the new cement plant, on the site of which pile driving for the construction of a wharf was started recently. A total of 51,000 creosoted piles and 400,000 ft. of lumber will be used in the construction of the wharf.

The ships will bring crushed lime rock to Seattle and carry supplies from this port to the Dall Island quarries.

It was announced Saturday that Capt. J. E. Guptill and Capt. Charles McGregor, veterans of the northern routes, will command the ships. They will bring the vessels to Seattle from Camden.—*Seattle* (Wash.) *Times.*

Four Cement Companies Said to Have Bid for Warrior Plant

OVERTURES to merge were received from four different organizations by the Warrior Cement Corp. As a result of the proposals, Col. Clarence Steward, president of the Warrior Cement Corp., called a meeting of stockholders for April 27 to consider the merger proposals. The Warrior corporation was formed in 1925 and took over the Gulf States Portland Cement Corp. at that time.—*Chattanooga* (Tenn.) *News.*

[The purchaser chosen was the International Cement Corp., as noted elsewhere in this issue.—The Editor.]

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Products Men Gather for Sales Conferences in Illinois and Iowa

All Agree That Selling Is the Key to Profits and Success

THOSE manufacturers in the products industry who may be in the depth of gloom would have received a tonic guaranteed to drive the bluest of the blues away had they been on hand at any one of the six merchandising conferences conducted in Illinois, April 16 to April 27.

The reception accorded these gatherings, held in Rockford, Joliet, Peoria, Champaign, East St. Louis, and Davenport, Iowa, was more than gratifying. When a man will sit through a three- to four-hour talk with an attentive ear and then ask for a return engagement on the same subject, as was done on several occasions, it is rather sound proof that he not only was interested but that he realized he was listening to something that was going to be of real value to him. And this was the sort of response obtained at each of the six Illinois conferences.

Among the many interesting issues developed in these meetings during the informal discussions was the fact that a large number of products manufacturers are not thoroughly sold on their own product. That is to say, they still consider concrete block as a material for foundations alone and not as suitable material for the wall above grade. Others believe that a special facing of some sort is necessary in order to sell the block. In other words, they have been trying to sell the foundation and the surface and not the wall.

The idea of getting out and actually selling concrete products in an aggressive manner, in the same way that any other industry has to sell its goods, appeared to be rather new to a large number of the 105 manufacturers who attended the meetings. Again we found those who felt that an occasional "pep" meeting would be enough to keep everyone on his toes and going after business.

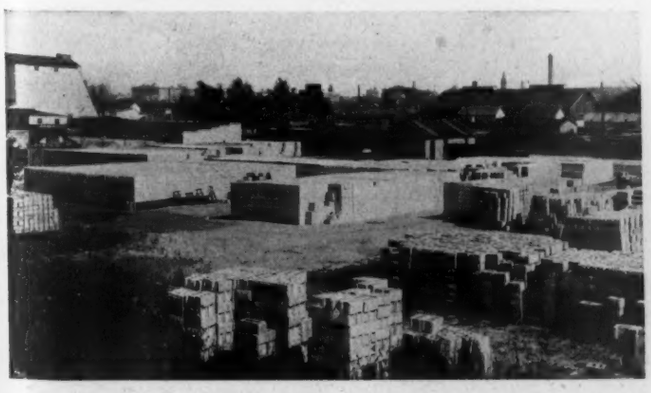
Such questions and problems as those mentioned above give ample proof of the need for these sales conferences. While manufacturing and plant problems are still of real interest and importance, most of the products men who attended the meetings were in accord with the idea that selling was the key to profits and success in the industry today, and they all declared their intention of giving more thought to merchandising their products in an aggressive manner from now on.

The conferences held in Illinois were found to be quite opportune, inasmuch as a number of manufacturers had already employed salesmen but were at somewhat of a loss just how to train them and start them out to sell concrete masonry to the building trade. The comprehensive manner in which the selling and advertising sessions of the conferences covered these problems was a real help to these manufacturers. Others, who were hesitating over the question of hiring salesmen, decided to do so without further delay.

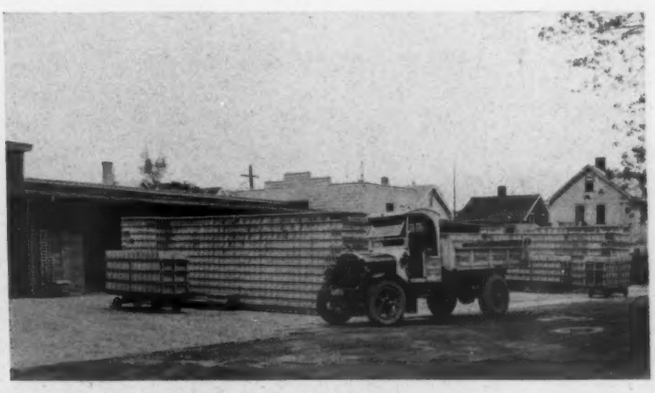
With over fifty sales conferences scheduled in masonry centers throughout the country at the present time, and a reception on the part of the manufacturers similar to that given those held in Illinois, there is every reason to believe that 1928 will witness a noteworthy increase in the production and sales of concrete masonry.

The schedule for concrete products sales conference during the next four weeks is as follows:

May 14—Indianapolis, Ind.
May 15—Chicago, Ill.
May 16—Louisville, Ky.
May 18—Nashville, Tenn.
May 21—Knoxville, Tenn.
May 21—Clarksburg, W. Va.
May 23—South Bend, Ind.
May 23—Pittsburgh, Penn.
May 25—Erie, Pa.
May 28—Columbus, Ohio.
May 31—Zanesville, Ohio.
June 1—Akron, Ohio.
June 4—Youngstown, Ohio.
June 6—Cleveland, Ohio.
June 8—Toledo, Ohio.
June 11—Springfield, Ohio.
June 13—Cincinnati, Ohio.



A well-kept and well-filled yard will advertise itself



This yard shows at a glance that "Service" is the company's watchword

Are You Neglecting a Valuable Market at Your Door?

Growing Demand Found for Units for Sanitary Systems

By M. R. Bowers
Promotion Engineer, Portland Cement Association

MODERN BUSINESS in its daily struggle to meet competition is not unlike a football squad fighting its way to victory on the gridiron. Only by giving strict attention to every detail in training the individual members of the squad can the coaches hope to develop a winning team. In the same way successful leaders in industry strive to see that the smallest detail is not neglected to win over the last possible consumer.

Science and inventive genius are called upon to develop new improvements, not only in production methods, but in the goods themselves, as a part of this effort to secure ultimate consumer acceptance of an industry's products. It has been truly said that when competition is keenest, the consumer is king.

In this day of lower production costs and expanding markets, we find that our own concrete products industry has failed to develop its full market possibilities. For several years a certain product of merit and unusual value has been waiting at the doors of the industry to be manufactured and merchandised, but for the most part manufacturers have continued to ignore its presence. This product is concrete manhole block.

Concrete manhole and catch basin block have been used extensively in Chicago and its suburbs for a number of years and have found a great favor among sewer contractors of that city. Recently these units have been introduced in such towns and cities as Gary and Terre Haute, Ind., Racine, Wis., and several other mid-western municipalities. Manufacturers in the above mentioned localities are profiting by pushing the product to its full potential market, which is limited only by the growth of cities and adjoining communities and the demand for municipal improvements.

Hand in hand with the growth and expansion of cities and towns marches an ever-increasing need for larger and more extensive sewage disposal systems. The greatest step forward is the sewerage system. Sanitation cannot be regarded as a luxury, and American cities have been educated to consider cleanliness as necessary as proper food and shelter. The result is that not only in our large cities, but in the small towns and communities there is a continuous need and demand for more sewer construction.

Units for Sanitary Work Needed

Let us consider for a moment just what a mile of sewer work can mean in the way of manhole and catch basin block. The average number of manholes built in a mile of either sanitary or storm sewer construction is 18, requiring between 2500 and 3000 block or more. Curb catch basins are frequently required for each mile of storm sewer with an average of 60 to the mile, using 5000 or more block altogether. In Chicago, for each mile of sewers 200 house catch basins to trap greasy wastes are specified, for which 19,000 block are required. Thus the total number of manhole and catch basin block that may be used in a mile of sewerage system ranges from 2500 to over 26,000 units. It is obvious that a few miles of sewer construction can mean a valuable market to any products manufacturer who will undertake to develop this business.

Concrete units designed for manhole and catch basin construction have horizontal cross-sections in the form of a segment of a circle, and are 6 in. to 8 in. in height and 6 in. in thickness. For the height, 6 in. is probably preferable because of the difficulty of handling the larger unit with its extra weight. Either tongue and groove or double-groove joints at the ends of each segment makes them rigidly interlocking when laid in the wall, giving the wall the strength and rigidity of a monolithic structure.

Individual units are so shaped that seven of them are required for a structure having a 30-in. inside diameter, eight units for 36-in., nine for 42-in., and ten for 48-in. This makes all units of approximately the same size and weight, making them all uniformly easy to handle and lay.

"Drawing in" or reducing the inside diameter near the top to fit a circular concrete cover with removable cast iron plate is usually required in the specifications. This is accomplished by the use of batter block, which are made in hand molds. One course of batter block will reduce the inside of a

Pile of concrete units for catch-basin construction

Stock pile of batter block for manholes

30-in. structure to 24-in. Two courses will reduce the 42-in. to 24-in., and four courses the 48-in. to 24-in.

Because of the fact that nearly all sewer construction is a municipal affair under the direction of city and county engineers, it is necessary that the initial work of promoting manhole and catch basin block be undertaken with these officials.

Once manhole and catch basin block have been written into the city specifications, an effective way to sell the block for the sewer job is to put on a demonstration before sewer contractors and officiating engineers. The fact that over 60% saving in labor and 50% saving in mortar is possible with concrete block in place of brick will usually convince the contractor that block is the only reasonable unit to use in manhole construction. The following is a conservative calculation of the cost of brick manholes versus concrete block manholes:

BRICK CONSTRUCTION

1800 brick at $15 per M	$27.00
Mortar	10.00
Labor	18.00
Total cost	$55.00

BLOCK CONSTRUCTION

142 block at 25c per unit	$35.50
Mortar	3.00
Labor	6.00
Total cost	$44.50

The actual comparative cost for any community can be figured by using current labor and mortar costs. It is safe to estimate that a crew consisting of one bricklayer and two helpers can build one brick structure 10 ft. deep and 48 in. inside diameter in an eight-hour day, while this same crew in the same length of time can build three block structures of this size. Thirty cu. ft. of 1:2 portland cement mortar usually will be required in the brick manhole and only 6 cu. ft. in each of the block manholes, whereas in the foregoing calculation this mortar estimate is very conservative.

Another advantage in block construction is the fact that street paving is delayed for only a minimum amount of time due to the speed that is possible in laying up a manhole with the concrete block unit.

Products men who have already entered the business of manufacturing and merchandising manhole and catch basin blocks have achieved considerable success. Manufacturers in other centers would do well to investigate this market and to bear in mind that the first man in the field usually gains an advantage in securing the cream of the business.

Wisconsin Products Manufacturers Set Standards for Cast Stone

CAST STONE manufacturers of Wisconsin, who met at the Milwaukee, Wis., Elks Club recently, have adopted a new and much improved specification for cast stone, according to E. B. Bushnell, secretary of the Wisconsin Concrete Products Association.

"For the first time in the history of the cast stone industry in Wisconsin, all the manufacturers have come to a perfect agreement on what constitutes a first class cast stone," said Ralph Albrecht of the Plastic Products Co. "Definite strengths and limits of absorption have been fixed to guarantee the architect a first class cast stone specification.

"All manufacturers are obliged to provide a mix of the day's run for test on instant demand of the secretary of the association. Cylinders are made of this mix in the approved manner and shipped to a recognized laboratory for test. Reports of these tests will be kept on file at the office of the secretary for public information.

"The trade name 'cast stone' was adopted as general for all products manufactured by members of the association. Plans for an extensive advertising campaign are being drawn to educate the building public to the many advantages of cast stone as a masonry and ornamental building material."

Manufacturers represented at the meeting were the Plastic Products Co., Christoffel Art Stone Co., Badger Art Stone and Brick Co., all of Milwaukee; Badger Concrete Co., Oshkosh; Badger Cement Tile Co., Plymouth; Wausau Concrete Co., Wausau; Julius Sorenson and Sons, Racine, and Wiegand Concrete Products Works, Green Bay. —*Milwaukee* (Wis.) *Journal.*

English Company Claims the Development of a Lustrous Concrete

THE production of cement products which will have crystalline surfaces similar to glass or polished stone has been attempted extensively in the past few years with negligible success as far as the inexpensive products are concerned. It is claimed now by the Cement Industries of Derby, England, that a process or formula which produces such a surface has been discovered after five years of experimenting, and the company is now preparing to develop its process in England and other countries.

The Cement Industries claim no new process nor have they a secret or patented formula for the combination of the materials. Essentially, the process is the combination of cement, sand, coloring, etc., in a certain definite relationship to form a plastic mixture, according to the statement of the company. Any of the new aluminate cements are used in the combination, and the process requires no furnace or firing. The company claims that it has overcome the difficulties generally encountered with aluminate cements, such as bad grinding, tendency to craze, etc. Their process calls for a special grinding of the cement at well-located central points from where it is to be distributed to the various individual users. It is claimed that to use this cement in its common form, without treatment and balancing of mixtures, requires almost impossible care in curing to successfully produce this work of good quality, while the usual dark blue appearance makes a good series of colors almost impossible. The uncontrolled crystal activity of this material is said to normally cause bleaching or hiding of the colors, destroying the original luster and altering the intended color effect. The Cement Industries believe that they have gotten around these difficulties now.

The company claims their product will meet any test of durability and strength that any regular concrete will meet. The surface is waterproof, and will not blister or show bubbles, nor does it require polishing, filling-up or other finishing treatment to develop the gloss, it is said. Also it is tested for temperature ranges from 30 deg. below zero, Fahr. to 500 deg. Cent., according to the statement. Colors may be subdued shades or brilliant effects, and the coloring may be shaded if desired. Also artificial marble with its color effects may be produced, it is said.

The products suitable for manufacture by this process are constructional units, both interior and exterior, fancy architectural pieces, panels, cork slabs and building boards, fireplace pieces, tiles and other sundry lines, according to the Cement Industries' report.

The company is at present seeking the development of this process through this country and England by selling its service and process to firms already in the cement products business or firms intending to enter this field. While the central company owns some patents connected with the process, it is specifically stated that the benefits derived to the participating firms is in the experience of the company, since the formula itself is not patented. Also the Cement Industries are preparing to establish central grinding plants from which the local companies will be able to obtain the materials at a reasonable cost.

Block Company Enlarges Plant at Joliet, Ill.

THE WELSCH WATERPROOF BLOCK CO., Joliet, Ill., according to reports, will spend $70,000 upon enlargement of its plant upon the 15-acre tract recently acquired for addition of Nel-Stone units to its line of products. The Welsch plant will have a production capacity of 500 units daily, each unit being a foot square and 6 to 8 in. thick. Nel-Stone is a form of concrete block with passages left for placing reinforcing rods that may be grouted in after the blocks are in place, according to the manufacturers.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	⅛ inch and less	¾ inch and less	1⅛ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.		1.30	1.10	1.00	1.00	
Frederick, Mo.	.50@ .75	1.35@1.45	1.15@1.25	1.10@1.20	1.05@1.15	1.05@1.10
Ft. Spring, W. Va.	.35	1.30	1.30	1.25	1.20	1.15
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.75	1.35	1.15	.95	.85	1.35
Walford, Penn.			1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.			.50	.50	.50	1.50
Alton, Ill.	1.85		1.85			
Columbia and Krause, Ill.	.90@1.25	.80@1.35	1.00@1.35	.90@1.35	.90@1.35	
Cypress, Ill.	1.00@1.25	1.00@1.25	1.20@1.25	1.20@1.25	1.20@1.25	1.35
Dubuque, Iowa (h)	.80	1.00	1.35	1.35	1.35	1.35
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.00	1.00
Lannon, Wis.	.80	1.00	.90	.90	.90	.90
Linwood, Iowa	1.10	1.50	1.50	1.30	1.40	1.40
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.		.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Northern Ohio Points	.85@1.10	1.25	1.15	1.10	1.05	1.05
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	
Stone City, Iowa	.75		1.10	1.05	1.00	1.00
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20			1.75		1.75
Waukesha, Wis.		.90	.90	.90	.90	.90
Wisconsin Points	.50		1.00	.90	.90	
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Cartersville, Ga.	1.25	1.65	1.65	1.35	1.15	1.15
Chico, Texas	1.00	1.30	1.25	1.20	1.10	1.05
Crystal River, Fla.	.50		1.75	1.75	1.50	
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Olive Hill, Ky.		1.00	1.00	1.00	1.00	1.00
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	
Rock Hill, St. Louis, Mo.	1.00	1.25	1.00@1.25	.90@1.25	.90@1.25	.90@1.25
Sugar Creek, Mo.	.75	1.00	1.20	1.20	1.20	1.20

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	⅛ inch and less	¾ inch and less	1⅛ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35		1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	
Duluth, Minn.	.90@1.00	2.25	1.75	1.55	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.35@1.40	1.80@2.10	1.80@1.90	1.40@1.50	1.40@1.50	
Richmond, Calif.	.75		1.00	1.00	1.00	
Spring Valley, Calif.	.75	1.10	1.10	1.10	1.10	
Springfield, N. J.	1.60	2.10	2.00	1.60	1.60	
Toronto, Canad (m)		5.80	4.05	4.05		
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	⅛ inch and less	¾ inch and less	1⅛ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	
Cayce, S. C.—Granite	.50	2.00	1.80	1.80	1.65	
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00		2.35			
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	
Middlebrook, Mo.	3.00@3.50		2.00@2.25	2.00@2.25		1.25@3.00
Richmond, Calif.—Quartzite	.75		1.00	1.00	1.00	
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.			1.30	1.25	1.20	1.20

(a) Sand. (b) to ¼ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¾ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.40. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .85. (p) Carload prices. (q) Crusher run, 1.40; screenings for ¼-in. granolithic finish, 3.00.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh..	6.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh..	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 50% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50 mesh....	1.50
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; 50-90% thru 4 mesh..	1.25
50-90% thru 100 mesh	1.35
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags	4.25
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 200 mesh....	3.50
Knoxville, Tenn.—80% thru 100 mesh; bulk	2.70
Linwood, Iowa—Analysis, 98% to 94% $CaCO_3$; 1.1% and less $MgCO_3$; 99% thru 150 mesh; paper sacks	6.00
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis 99.05% $CaCO_3$; 90% thru 50 mesh	6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh.....	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 95% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — 50% thru 100 mesh	1.50
Danbury, Conn.; Adams, Ashley Falls and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 5% $MaCO_3$; 90% thru 50 mesh, bulk	3.50
100-lb. paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25, 15 days.)	
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.00
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Linwood, Iowa—Analysis, 98% $CaCO_3$, 1.10% or less $MgCO_3$; 99% thru 4 mesh	1.10
99% thru 10 mesh	1.25
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.35
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	.90@1.50

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill. — Analysis, 50% $CaCO_3$; 42% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra)	3.50
Linwood, Iowa — Analysis, 94-98% $CaCO_3$; 1.10% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks	6.00
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25@3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75@2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.35
Ohlton, Ohio	3.00
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00@5.00
Silica, Va.	2.00@2.50
Ground glass sand, 140 mesh	8.00@12.00
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75@1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@1.00
Estill Springs and Sewanee, Tenn.	1.35@1.50	1.35@1.50
Ohlton, Ohio	*2.25	*2.25
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.	.65	.55	1.00	1.35	1.40	
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.	.60	.80			1.40	
Machias Jct., N. Y.	.75	.60	.75		.60	.60
Montoursville, Penn.	1.00	.80	.75	.65	.65	.60
Northern New Jersey	.60	.60	1.25		1.25	
Portland, Me.		1.00	2.25			2.00
Somerset, Penn.		2.00				
Washington, D. C.	.50@.55	.50@.55	1.20	1.20	1.00	1.00
CENTRAL:						
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.25@.80	.50@.70	.10@.40	.50@.70	.60@.80	.60@.80
Barton, Wis.		.40	.60	.65	.65	.65
Chicago District	2.00j					
Columbus, Ohio¶		.85	.85	.85	.85	
Des Moines, Iowa		.40	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.50	.50	.65		.95	
Elkhart Lake, Wis.	.60	.30	.50	.56	.50	.50
Ferrysburg, Mich.		.50@.80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@.80	.70@.90	.70@.90		.70@.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00		1.00	
Hersey, Mich.		.50		.60	.70	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Mankato, Minn.		.45g		.60@1.25h	.70@1.25	1.25e
Mason City, Iowa		.50	.85	1.30	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.85	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
SOUTHERN:						
Brewster, Fla.	.50	.50	3.00	3.00		
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.	.45@.50					
Fort Worth, Tex.	1.50	1.00@1.35	1.10@1.25	1.10@1.25	1.00@1.10	1.00@1.10
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.10
Macon, Ga.	.50	.50				
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.15@.25	.10@.20	1.00@1.25	.65@.85	.50@.65	.50@.65
WESTERN:						
Kansas City, Mo.	.70	.70@.75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@.40	.10@.40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Otay, Calif.		.35@.50	.60	.60	.60	.60
Phoenix, Ariz.	1.25	1.00	1.50	1.25	1.10	1.00
Pueblo, Colo.	.80	.60		1.20		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Burnside, Conn.		.75				
Des Moines, Iowa	.60					
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Fls., Wis					.65	
Fort Worth, Tex.						.85@.90
Gainesville, Texas					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		.50
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Washed and screened river sand. (h) ¾-in to ¼-in. (j) Lake sand, 1.75, delivered.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.10			4.00	
Beach City, Ohio	1.75@2.25	1.75@2.25		1.75	1.75		
Dresden, Ohio	1.25@1.50	1.25@1.50	1.50@1.75	1.00@1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10@1.50	1.25@2.00	2.00			2.75@3.00	
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30@ .35			
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	2.25	1.25					
Ohlton, Ohio (b)	2.25	2.25	2.50	2.00	1.75	2.25	2.25
Ottawa, Ill.	1.25	1.25	1.25	1.75	1.25	3.50	2.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Pottery sand, 8.00@12.00						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*@2.00	1.50*@2.00		1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Washed and screened, not dried. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	.75	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Lime Ridge, Penn.							5.00[3]	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[13]
Williamsport, Penn.			8.50@9.00		7.00	8.50[22]	5.00	
York, Penn., & Oranda, Va.	11.50†	8.50@9.50†	8.50@9.50†	8.50@10.50†	8.00	9.25	7.00	1.40[3]
CENTRAL:								
Afton, Mich.							7.80	1.35
Carey, Ohio	11.50	7.50	7.50		9.00		8.00	1.50
Cold Springs, Ohio		8.00	8.00				8.00	
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio[6]	11.50							
Milltown, Ind.		8.50@10.00		10.00[5]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Scioto, Ohio	11.50	7.50	7.50	8.50		.62½	7.50	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50@ 8.00	7.50@ 8.00	12.50	8.00	10.00[9]	9.00	1.50[3]
SOUTHERN:								
El Paso, Texas							7.00	
Frederick, Md.		8.00@9.50	8.00@9.50			9.50[15]	7.00[15]	
Graystone, Ala.	12.50	10.00		12.50		1.40[14]	8.50	1.50
Keystone, Ala.		10.00	8.00	10.00	8.00		8.00	1.50
Knoxville, Tenn.	19.25	8.50	8.50	8.50			7.00	1.25
Ocala, Fla.		10.00	9.00				10.00	1.40
WESTERN:								
Portland, N. M.							15.00	
Los Angeles, Calif.	16.00		16.00	16.00			16.00	
San Francisco, Calif.	19.50	16.00	13.00	19.50	14.50	.80	14.50	1.85
Tehachapi, Calif.[12]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [14] Per 2 bags of 90 lb. each. [15] To 8.00. [16] To 1.70. [22] To 9.00. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Crude talc (for grinding) 5.00
- Ground talc (20-50 mesh), bags 7.50
- Ground talc (150-200 mesh), bags 10.00
- Pencils and steel crayons, gross 1.00@ 2.00

Chester, Vt.:
- Ground talc (150-200 mesh), paper bags 9.00@ 9.50
- Same, burlap bags, bags extra 8.00@ 8.50

Chicago and Joliet, Ill.:
- Ground (150-200 mesh), bags 30.00

Cromleys Mt., Md.:
- Crude talc 6.00@ 7.00

Dalton, Ga.:
- Crude talc (for grinding) 5.00
- Ground talc (150-200 mesh), bags 12.00
- Pencils and steel worker's crayons, per gross 1.00@ 2.50

Emeryville, N. Y.:
(Double air floated) including bags;
- 325 mesh 14.75
- 200 mesh 13.75

Glendon, N. C.:
- Ground talc (150-200 mesh), bulk 6.00@10.00
- Ground talc (150-200 mesh), bags 8.00@14.00
- Pencils and steel crayons, gross 1.05@ 2.00
- Blanks, .08 per lb.; cubes 50.00

Hailesboro, N. Y.:
- Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh 15.50@20.00

Henry, Va.:
- Crude (mine run) 3.50@ 4.00
- Ground talc (150-200 mesh), bags 7.50@14.00

Joliet, Ill.:
Ground talc (150-200 mesh) in bags:
- California white 30.00
- Southern white 20.00
- Dark 10.00

Keeler, Calif.:
- Ground (200-300 mesh), bags 20.00@30.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), bags 12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

- Columbia, Tenn.—B.P.L. 65-70% 3.50@ 4.50
- Gordonsburg, Tenn.—B.P.L. 65-70% 3.75@ 4.00
- Mt. Pleasant, Tenn.—B.P.L. 72% 5.00@ 5.50
- Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72% 5.00
- B.P.L. 75% 6.00
- Twomey, Tenn.—B.P.L. 65%, 2000 lb. 8.00@ 9.00

Ground Rock

(2000 lb.)
- Centerville, Tenn.—B.P.L. 65% 8.00
- Gordonsburg, Tenn.—B.P.L. 65-70% 4.00@ 4.50
- Mt. Pleasant, Tenn.—B.P.L. 72% 5.00@ 5.50
- Twomey, Tenn.—B.P.L. 65% 8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)
(Per Ton)

- Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68% 3.25
- 70% min. B.P.L., Basis 70% 3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.
- Pringle, S. D.—Mine run, per ton 125.00
- Punch mica, per lb. .06
- Scrap, per ton, carloads 20.00
- Rumney Depot, N. H.—Per ton, Mine run 300.00
- Clean shop scrap 25.00
- Mine scrap 22.50@24.00
- Roofing mica 37.50
- Punch mica, per lb. .12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.— Pink marble chips	§3.00	§3.00
Crown Point, N. Y.— Mica spar		9.00@10.00
Easton, Penn.— Green stucco		12.00@18.00
Green granite		14.00@20.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash		11.00@18.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		4.00@ 5.50
Phillipsburg, N. J.— Royal green granite		15.00@18.00
Randville, Mich.— Crystalite crushed white marble, bulk	4.00	4.00@ 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Natrock" roofing grits		12.00@20.00
Tuckahoe, N. Y.—Tuckahoe white	10.00	
Warren, N. H.		¶7.90@‖8.95
Wauwatosa, Wis.		20.00@32.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 16.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.
¶C.L. ‖L.C.L.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 40 mesh to 200 mesh	15.00@28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 13.00; bulk	11.50
Pulverized. 95% thru 200 mesh; bags, 19.73@23.50; bulk	18.43@20.00
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O. 10%; Na_2O, 3%; Si_2O, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk. (Bags 15c extra.)	18.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich.(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Brandon, Vt.—Per ton	10.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass. (Limestone	‡7.50@*9.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton, including sacks	15.00
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	9.00@10.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	17.50*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50@15.00*
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50b
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada	13.50@16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M, 10th of month. (b) Red, $16. Crude, $9.00. (d) 5% disc., 10th of month.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	84¼	3.37
Atlanta, Ga.		2.35
Baltimore, Md.		2.15‡@2.25
Birmingham, Ala.		2.10
Boston, Mass.		2.13@2.23
Buffalo, N. Y.		2.00‡@2.10
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa		2.24
Charleston, S. C.		2.35
Cheyenne, Wyo.	.64	2.56
Chicago, Ill.	.51¼	2.05
Cincinnati, Ohio		2.22
Cleveland, Ohio		2.24
Columbus, Ohio		2.22
Dallas, Texas		2.00
Davenport, Iowa		2.24
Dayton, Ohio		2.24
Denver, Colo.	.63¾	2.55
Des Moines, Iowa		2.05
Detroit, Mich.		1.90
Duluth, Minn.		2.04
Houston, Texas		2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.		2.10
Jacksonville, Fla.		2.20
Jersey City, N. J.		2.03‡@2.13
Kansas City, Mo.		1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.		2.10
Milwaukee, Wis.		2.20
Minneapolis, Minn.		2.12@2.22
Montreal, Que.		1.60
New Orleans, La.		2.07
New York, N. Y.		1.93‡@2.03
Norfolk, Va.		2.07
Oklahoma City, Okla.		2.46
Omaha, Neb.		2.36
Peoria, Ill.		2.22
Philadelphia, Penn.		2.11‡@2.21
Phoenix, Ariz.		3.26
Pittsburgh, Penn.		2.04
Portland, Colo.		2.80
Portland, Ore.		2.40‡@2.60
Reno, Nev.		2.91
Richmond, Va.		2.24‡@2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.51
Savannah, Ga.		2.50
St. Louis, Mo.		1.95
St. Paul, Minn.		2.12@2.22
Seattle, Wash.		2.60@2.70
Tampa, Fla.		2.25
Toledo, Ohio		2.20
Topeka, Kan.		2.41
Tulsa, Okla.		2.33
Wheeling, W. Va.		2.12
Winston-Salem, N. C.		2.44

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Bellingham, Wash.		2.40
Buffington, Ind.		1.80
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.60
Davenport, Calif.		2.45*
Hannibal, Mo.		1.90
Hudson, N. Y.		1.75
Leeds, Ala.		1.65
Lime and Oswego, Ore.		2.90‡
Mildred, Kan.		2.35
Nazareth, Penn.		2.15
Northampton, Penn.		1.75
Richard City, Tenn.		2.05
Steelton, Minn.		1.85
Toledo, Ohio		2.20
Universal, Penn.		1.80

NOTE—Add 40c per bbl. for bags.
*Includes sacks. ‡10% discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.70	4.00	4.00	4.00	4.00	4.50	.....	.....	.....	.....	.....	15.00	20.00
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Blue Rapids, Kan.	1.70	4.00	.....	.....	.....	.....	10.00	.....	.....	.....	.....	15.00	20.00
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	.....	.....	7.25	.....	.....	13.00	14.00	.....
Douglas, Ariz.	.....	.....	6.00	14.50	15.00	.....	18.00	.....	30.00	.....	.....	.....	.....
Fort Dodge, Iowa	1.70	4.00	6.00	9.00	9.00	9.50	.....	.....	.....	19.00	.....	15.00	20.00
Grand Rapids, Mich.	1.70	4.00	6.00	9.00	9.00	9.00	.....	.....	.....	19.00	.....	15.00	20.00
Gypsum, Ohio	1.70@3.00	4.00	6.00	7.00@9.00	9.00	9.00	19.00	7.00	24.50	19.00	.....	15.00	20.00@25.00
Los Angeles, Calif.	.....	.....	7.50@9.50	11.50y	.....	.....	.....	.....	.....	.....	.....	.....	.....
Medicine Lodge, Kan.	1.70	4.00	.....	.....	.....	.....	.....	.....	15.00	.....	.....	15.00	20.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	9.00	13.40	14.40	.....	15.40	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.10	10.50	10.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Hardwall plaster, 13.00; casting, finishing, molding, 14.00. (m) Includes paper bags; (o) includes jute sacks; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	16.00	.....	.....
Detroit, Mich. (d)	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00*	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind.	.10@ .12a	.....	.....
Los Angeles, Calif.	4x8x12—5.00*	4x6x12—4.20*	
Oak Park, Ill.	18.00*	23.00*	30.00*
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.	
Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50

†Price per square.

Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Columbus, Ohio:	
5x8x12	6.50
Grand Rapids, Mich.:	
5x8x12	8.00
Longview, Wash.:	
4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Oak Park, Ill. (Haydite):	Per 100
4x8x16	15.00
8x8x16	22.00
8x12x16	30.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
	Each
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per M:	
3 in.	40.00
4 in.	50.00
6 in.	75.00
8 in.	100.00
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Clinker	11.00	.....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00@16.00	19.00@40.00
Mt. Pleasant, N. Y.	.....	14.00@ 23.00
Oak Park, Ill.	.....	37.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@ 55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.50@ 25.00
Rapid City, S. D.	18.00	30.00@35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in
Detroit, Mich.								15.00 per ton									
Grand Rapids, Mich.		4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off															
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Longview, Wash.							Sewer pipe 40% off list; culvert—list										
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.							6 in. to 24 in., $18.00 per ton										
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.							12.00 per ton										
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tacoma, Wash.	.15	17	.22½	.30	.40	.55	.70	1.55	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.70	.....	2.00	.....	2.75	3.40	.....	6.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Yakima, Wash.							1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths; (b) Reinforced.
*21-in. diam. ‡Price per 2-ft. length.

Price for Building Material

THE latest bulletin of the Division of Building and Housing of the U. S. Department of Commerce presents a valuable means of studying the prices for various building materials throughout the United States, and shows the relationship between the locality and the market prices. The prices given are those paid by contractors all over the United States on April 1.

Prices for portland cement range from a low price of $2.28 per barrel at Poughkeepsie, N. Y., to the high prices of $3.50 at Tucson, Ariz., and $3.60 at Shreveport, La. Throughout the east the prices generally run about $2.85 per barrel and in the middle west the average is about the same, although there is a considerable range from $2.30 at Lorain to $3.20 at Toledo, Ohio. As usual, there is only a slight range of price on the Pacific coast, from $2.60 at Portland and Long Beach to $2.80 at San Francisco.

The lowest prices for hydrated lime are quoted at Baltimore ($13), Chicago ($13.50) and Washington ($14). Kansas City, Mo., shows the high price of $28 and Tucson, Ariz., is the highest at $30. Except for these exceptional figures, the prices over the whole country average $18 and range as low as $16 and up to $20. The prices on the Pacific coast average somewhat higher, from $22 at Seattle to $26 at San Francisco.

The low price on ¾-in. crushed stone is $1.50 per cubic yard at Portland, Ore. Prices on the Pacific coast range up to $2.40 at Long Beach. The highest price in the U. S. is at Indianapolis ($4.50). Prices in the central states generally are high and average around $3.00, except at Chicago ($2.13), Milwaukee ($2.25), and St. Louis ($1.95). Ohio prices are $2.50 and $2.75. In the East, the range is from $2.08 at Paterson, N. J., to $3.25 at Yonkers, N. Y.

There is a wide range in the prices for building sand, the lowest quotation being $1.00 at Columbia, S. C., and the highest $4.39 at Scranton, Penn. In New England the price is $1.25 to $1.75, and in the Atlantic States the range is from $1.75 to $2.50. Ohio prices are $2.25 to $2.75, except at Youngstown, where the price is $3.75. In the Central States the prices average slightly below $2.00. On the Pacific Coast the low price is $1.50 at Portland and the highest figure is $2.45 at San Francisco

Alpha Portland Buys Phoenix Birmingham Plant

G. S. BROWN, president of the Alpha Portland Cement Co., authorizes the publication in ROCK PRODUCTS of the following statement:

The Alpha Portland Cement Co. has purchased, as of May 1, the property of the Phoenix Portland Cement Corp. at Birmingham, Ala. This acquisition will increase the productive capacity of the Alpha company to 12,500,000 bbl. yearly.

This plant was built in 1926 and started operations in March, 1927. It is well designed, modern in every respect and has ample reserves of raw materials, whether it be operated at its present capacity or increased in size. It is so designed that an increase in capacity of 50% can be readily and economically made.

The Alpha company formerly had a large business in the southeastern and gulf states, but in recent years has had no share in the cement business in that territory because the freight rates from its northern plants were so high that it could not compete with the more favorably located southern plants. This property will enable Alpha again to serve the South.

Lindley C. Morton, the former president of the Phoenix Portland Cement Corp., is retiring from the cement business in order to devote himself entirely to his large personal interests. R. J. Hawn, the vice-president, will also retire from the company. Aside from this no change in personnel connected with this plant is contemplated by the Alpha company.

Alpha now owns, in addition to its large operation at Martins Creek, Penn., plants near Catskill, N. Y., near Syracuse, N. Y., at Manheim, W. Va., at Ironton, Ohio, at Bellevue, Mich., at LaSalle, Ill., near St. Louis, Mo., and through its purchase of the Morton plant in Birmingham is very well equipped to take care of cement business throughout the territory east of the Mississippi river in addition to the territory served from its St. Louis mill.

[A detailed description of the Birmingham plant of the Phoenix Portland Cement Corp. was published in ROCK PRODUCTS, issue of June 25, 1927.—Editor.]

Martin B. Madden

MARTIN B. MADDEN, quarryman, Illinois congressman and a political figure of national importance, died at his desk in the House of Representatives, April 27. Heart failure caused his death, said to have been brought on from overwork. He was 73 years of age.

Representative Madden was a former crushed stone producer and at one time was president of the Quarry Owners Association of the United States, an organization which antedated the National Crushed Stone Association and which was composed of both cut stone and crushed stone producers. At that time he was president of the Western Stone Co., which had a quarry at Lemont, Ill.

Quarry work engaged many of Representative Madden's working years, for he started as water boy in the Lemont quarry when he was little more than a child, and rose from that humble beginning to be the head of the company. Then he broadened the scope of his activities and became a bank director, president of the Illinois Manufacturers Association and vice-president of the Builders and Traders Exchange of Chicago. He went into politics and was serving his twelfth consecutive term in the House of Representatives when he died.

He was the son of an English farmer, John Madden, of Darlington, England, where he was born, four years before the family emigrated to America and settled in Lemont. The family lived on a farm near Lemont for some years, but in later life Mr. Madden, who had moved to Chicago, made his home in Hinsdale, a suburb of the city.

The political career of Mr. Madden was a brilliant one, as for many years he was chairman of the powerful apppropriations committee. Of late years he was regarded as the administration's leader in the House, and engaged in many successful legislative battles to further the administration's program. After his death his body lay in state in the capitol and then was taken to Hinsdale for the funeral and interment.

Carolina Cement Co.'s Plans Reported Ready

PLANS for the projected plant of the Carolina Cement Co., at New Bern, N. C., are reported to be ready by the *New Bernian* of that city. The paper says:

The proposed site for the cement plant will contain 41.9 acres of land, with a waterfront of 700 ft. A canal extending 100 ft. will be built from the river.

Plans are already made for the buildings to be erected at the plant. These will be:

Storage building, 580x180 ft., for the storing of raw materials, with three separate compartments for marl, coal and clinker; a power house, 160x160 ft., a $152,000 power plant, 5000-k.v.a.; kiln building, 110x500 ft.; a grinding building, 100x460 ft., for raw materials and finished products; a machine shop, 50x160 ft.; a clay wash mill building, 50x60 ft.; 12 raw material storage silos, 25 ft. high and 20 ft. in diameter, for raw materials; a packing house, 67x50 ft.; an adjacent cement silo storage plant containing 32 bins 16½ ft. in diameter, 80 ft. high; a storeroom, 50x80 ft., and a main office, 50x50 ft.

The initial capacity will be 4200 bbl. of cement a day. This daily total of 25 carloads may be increased later. This output would amount to 6,000,000 sacks of cement yearly.

Samuel E. Flexner is the consulting engineer in charge of the work.

Northeast Ohio Producers Want Sand and Gravel Convention

MEMBERS of the Northeast Ohio Sand and Gravel Association met in a special meeting at the Hollenden Hotel, Cleveland, Ohio, May 2. The purpose of the meeting was to impress upon the National Sand and Gravel Association the advantages of Cleveland for the next annual sand and gravel convention, and R. C. Fletcher, president of the national association, and V. P. Ahearn, executive secretary, were present by special invitation. At a previous meeting the members had decided to extend this invitation and to co-operate with other agencies that are trying to bring as many conventions as possible to Cleveland. These were represented at the meeting by G. L. Bowe of the Cleveland Convention Bureau.

The meeting (which followed a luncheon) was of an informal nature, although there was plenty of information given the representatives of the national association to enable them to judge of the advantages of Cleveland as a convention city. There were no set speeches. President Knight of the association called on several members to give their views and brief talks on the work of the national body and the importance of conventions to its growth were made by the president and secretary.

The member companies and their representatives who were present were:

Massillon Washed Gravel Co., Massillon; E. P. Thomas, C. E. Swanson.

Cleveland Builders Supply Co., Cleveland; Clarence Ehle, Frank R. Auhlenbacher.

Greenville Gravel Corp., Greenville; Guy Baker, M. G. Kerr, C. E. Glander.

Rubber City Sand and Gravel Co., Akron; Hal G. Knight, R. G. Hawley, W. S. Harris.

Kent Sand and Gravel Co., Kent; R. Walling, L. R. Farrell.

M. A. Callahan, Cleveland; Norman Callahan, Nelson Callahan.

Mantua Sand and Gravel Co., Mantua; K. A. Boulkan.

The guests were:

R. C. Fletcher and V. P. Ahearn, National Sand and Gravel Association.

G. L. Bowe, Cleveland Convention Bureau.

Edmund Shaw, ROCK PRODUCTS.

A. C. O'Laughlin Acquires Howard Gravel Co.

THE Howard Material Co., a gravel concern operating in Afton, Wis., was recently sold to A. C. O'Laughlin of Chicago, Ill. The property, comprising about 200 acres, is in sections 28 and 21 in the town of Rock, Wis., just north of Afton, along the railroad and road. Since taking over the gravel lands the Howard company has put in much equipment and several sidings for loading cars. According to reports, the pits will continue to be operated as in the past.—*Janesville* (Wis.) *Gazette.*

New Machinery and Equipment

A 400-Mesh Wire Cloth Made

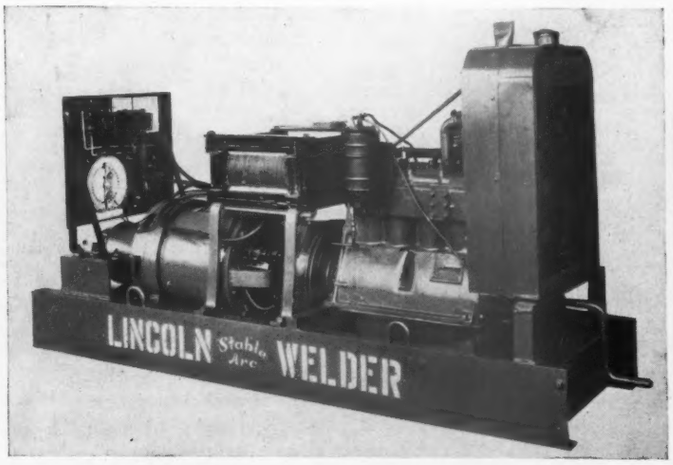
THE Newark Wire Cloth Co. of Newark, N. J., announces that it has succeeded in making a wire cloth to be used in testing sieves which has 400 openings to the linear inch or 160,000 to the square inch. Up to this time the finest mesh cloth regularly made contained 325 openings per square inch (No. 325 of the U. S. Bureau of Standards sieves).

The great difficulty in making so fine a screen has been to draw a wire sufficiently fine that would have the correct temper and be uniform in quality. The Newark Wire Cloth Co. draws its own wire and has succeeded in making a wire which could be woven to so fine a mesh, according to its announcement.

There are 1,000,000 holes in a pieces of the new cloth 2½-in. square.

New Light Weight Arc Welder

LINCOLN ELECTRIC CO., of Cleveland, Ohio, has announced a new model of the "Stable-Arc" welder, known as model S-1960, which is a self-contained, lightweight, portable arc welder, having its own motive power. The new unit is not designed to displace the company's heavy engine-driven welder, but to meet the need for a light portable welder. The new unit has a rating of 200 amperes according to N. E. M. A. standards, with a current range for welding duty of from 50 to 300 amperes, and operates at a speed of 1500 r.p.m. Motive power is provided by a four-cylinder Continental "Red Seal" engine, type H-9.



Light-weight, self-contained, portable arc welder

The welding generator and engine are mounted on a structural base welded into a solid piece of steel. This welded steel base provides stiffness and rigidity with a minimum weight, according to the manufacturer. The whole unit weighs only 1580 lb. and is only 76 in. long by 25 in. wide. The generator is constructed of steel instead of cast iron, which is sometimes used on welders, thus reducing weight and also reducing the possibility of breakage in the field.

The complete magnetic circuit of the generator is of laminated steel structure, which increases the stability of the arc, the company claims. This is desirable in the work for which this unit was brought out, because many times welding must be done in a vertical plane, and frequently overhead. A steel switchboard is also provided in place of the usual slate or composition board, to further reduce the possibility of damage in the field.

New High-Carbon Chain for Chain Hoists

THE Ford Chain Block Co. of Philadelphia, Penn., is now manufacturing a high-carbon, electrically-welded chain for the company's "Tribloc" hoist. This chain is thoroughly tested at the factory, the manufacturers claiming that every link is tested by special instruments, and that the assembled chain is made to withstand 50% overload above its rated capacity. These chains are now being used on Ford hoists having capacities rated from ¼ ton to 20 tons.

New electrically-welded chain with hoist

New Electric Hoist

A MOTOR trolley electric monorail hoist that operates in 15½ in. headroom is announced by the American Engineering Co., of Philadelphia, Penn., as an addition to its line of Lo-Hed hoists.

This hoist is built in half ton and ton sizes and is similar in construction to the standard Class A Lo-Hed hoist, except that it is mounted on an 8-wheel trolley that reduces the headroom requirement by more than five inches.

It is made for operation with a.c. at 20 f.p.m. or d.c. at 20 to 40 f.p.m. and a special high-speed hoist provides for operation at 40 f.p.m. with a.c. and 40 to 80 f.p.m. with d.c. Standard height of lift is 20 ft., but when required a lift of 25 ft. can be provided. Four ropes are used. Remote control of both hoist and trolley motors can be provided.

Pneumatic Conveying

By Arthur E. Nealy
Holly Pneumatic Systems, Inc., New York

A PIONEER in its development, and one of the foremost exponents of pneumatic conveying today, is the Holly Pneumatic Systems, Inc. Fundamentally the Holly pneumatic conveyor may be considered as a high velocity air stream in which the material conveyed is suspended. This air stream may be induced by a vacuum, or produced by pressure, Holly conveyors being made in both vaccuum and pressure types.

The vacuum type conveyor consists of a suction nozzle with a suitable length of flexible hose, pipe line, recipient-discharge unit and source of vacuum. The conveyed material is drawn through the suction nozzle into the conveying line, which may be any length between 25 and 2000 ft. to suit the layout.

The material is carried through the conveying line to the discharge end of the system which consists of the recipient into which the material enters an adequate discharge mechanism and an automatic dust arresting device.

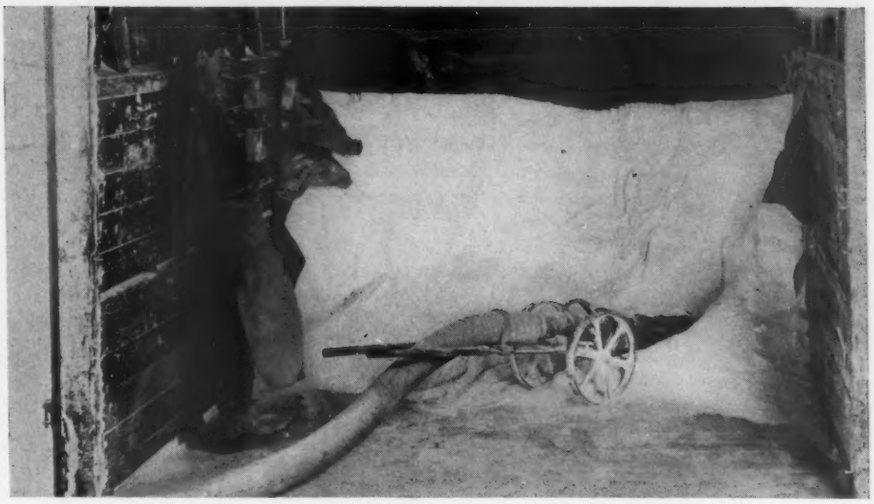
Most of the conveyed material drops to the bottom of the recipient as the air stream is suddenly expanded in entering. The finer particles are carried with the air to a suitable dust collector, where they are caught. An automatic shaking device discharges the collected material at intervals into the recipient below. The material in the recipient is discharged through the Holly rotary lock which provides for continuous discharge without affecting the vacuum of the system. From the lock it drops to a storage pile or bin. Where partial storage and partial

distribution is required, a combination of the Holly vacuum and pressure type conveyors will be found most desirable.

The pressure type system consists of a high-pressure type blower, feeding device, pipe line and discharge nozzle, chamber or recipient. The feeding device, supplied by gravity from a storage bin or hopper, admits a uniform amount of material to the conveying air stream at a point close to the source of pressure. The material is discharged through a nozzle when it contains little dust, or the dust is not objectionable. This nozzle distributes the material without the necessity of shoveling or trimming. Where the dust is objectionable, suitable means of eliminating it are provided.

The utter simplicity of picking up and setting down materials where they are wanted with a minimum loss of time and labor constitutes the principal advantage of the pneumatic system. Pneumatic conveyors easily bridge the gaps in plant layout which otherwise might involve manual handling or complicated mechanical conveying devices.

Another advantage of the pneumatic system of conveying bulk materials is the elimination of generated dust, with consequent dangers to the health of employes, and the loss of valuable products. This matter of waste or spillage is an important one. Pneumatic conveyors leave containers broom-clean. A freight car, for instance, emptied by the pneumatic system, retains none of the bulk material, however fine this may be.



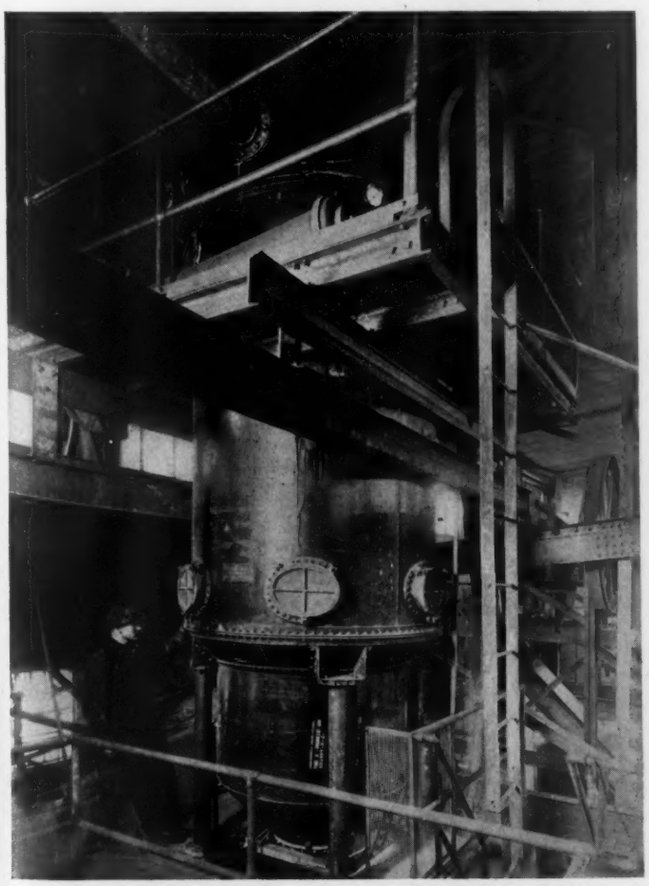
Unloading a railroad car with a pneumatic conveyor

Flexibility is another important advantage of the pneumatic system. Installation consists almost entirely of pipe-fitting. Little floor space is required and conveying lines are easily installed wherever desired.

Practically every dry or semi-dry bulk material can be handled by the pneumatic method. No particular limit can be set as to size or weights because of the smaller sizes of coal, crushed stone, nuts, pebble phosphate and ores are as easily handled as sand, chemicals and other fine materials.

Layout in every plant is different because no two installations are alike. The application in various industries is different but usually falls into one of these classes:

Pneumatic conveyors for loading and unloading freight cars, barges and ships at dock, disposing of large quantities of dust and accumulated material in factories, the transportation of large quantities of raw material from one part of a factory to another and moving it between buildings.



A pneumatic conveyor unit installed in the plant

Movable pneumatic conveyor unit placed on railway trucks

France Stone Co. and Wagner Quarries Co. Reach an Agreement

A JOINT ownership and operating agreement is reported to have been reached between two factions in the ownership of the Wagner Quarries Co., Sandusky, Ohio. The France Stone Co. interests have held a large block of stock in the Wagner Quarries Co. for a number of years. About two years ago the France interests acquired a few more shares of stock from a Sandusky holder, which gave them control. When a reorganization was threatened, W. J. Sprow and others went into court and secured an injunction which has since been in effect, and he continued to run the business.

By the terms of the agreement finally reached, the Toledo and Sandusky interests each hold one-half of the stock of the company, each naming three directors, a seventh director to be a man interested in neither.

With the dismissal of the injunction suit, stockholders elected as directors Richard D. Logan and George P. Hahn, Toledo attorneys, and H. E. Bair of Toledo, representing the France interests, and Alex M. Wagner, W. J. Sprow and Clarence E. Wagner, representing the Sandusky interests. R. K. Ramsey was chosen as the seventh director.

The directors at once re-elected Alex M. Wagner, president; William J. Sprow, vice-president, secretary and general manager, and Clarence E. Wagner, treasurer.—*Tiffin* (Ohio) *Advertiser.*

Arkansas Cement Said To Be Ready to Start Construction

DEVELOPMENT of portland cement properties in southwest Arkansas now is under way on a large scale and in less than a year's time extensive production will be in progress.

The Arkansas Portland Cement Co., which acquired large deposits in the southeast corner of Howard county last year, will start immediately the construction of a 3000-bbl. plant to cost $2,000,000, which will be the first unit of a 6000-bbl. plant.

This plant will be situated four miles west of Saratoga, four miles south of Schaal, a station on the Graysonia, Nashville and Ashdown Railroad, and six miles east of White Cliffs on the Little river.—*Nashville* (Tenn.) *Banner.*

New Jersey Sand and Gravel Co. Improves Plant

THE New Jersey Sand and Gravel Co., which has several plants in New Jersey, is making important improvements in its Farmingdale plant. A Niagara screen and a Dorr separator have been installed with a system for the rapid loading of cars.

D. W. Newman, vice-president and general manager of the company, worked out the method used.

Burton A. Ford Made Sales Manager of Valve Bag Co.

AS NOTED briefly in ROCK PRODUCTS, April 28, p. 100, Burton A. Ford, whom all lime manufacturers will recall as general manager of the National Lime Association, is now sales manager of the Valve Bag Co., Toledo, Ohio.

Burton A. Ford

Mr. Ford succeeded William R. Phillips as general manager of the National Lime Association in 1923 and served in that capacity until 1926. Prior to that he was a division manager of the Virginia-Carolina Chemical Co. and secretary-treasurer of the Bryant Fertilizer Co. He is a graduate of the University of Maryland.

Since leaving the National Lime Association he has been in business for himself as a builder in the suburbs of Washington, D. C.

California Portland Cement Co. Expands

THE expansion program of the California Portland Cement Co., at Colton, Calif., has been enlarged to a half-million-dollar project. Two new kilns, measuring 10 by 204 ft., and eight raw-mix silos are on the present expansion program. The silos will be 32 ft. in circumference and 65 ft. deep. They will have a total capacity of 14,000 tons. The new units of the plant will be connected with the Fleming dust collector which was installed a number of years ago. The plant is at present employing about 1000 men in production and construction work.

George H. Boynton

GEORGE HERBERT BOYNTON, for many years prominent as an engineer and in the rock products industry of Iowa, died at his home in Muscatine, Iowa, April 20. He was 75 years old.

Mr. Boynton was born in Meredith Village, N. H., and came to Iowa when a young man. He resided in Rock Island, Ill., and Davenport, Iowa, for about 50 years. For about half of that time he was engineer for the Chicago, Rock Island and Pacific railroad. In 1917 he became president of the Northern Gravel Co., of Muscatine, and moved to that city, which he made his home until his death.

Mr. Boynton had a wide acquaintance with the sand and gravel producers of the middle west and especially those of his own state. He had many close friends among them. During his work as an engineer he had a more than local reputation, and his work as an engineer gave him an unusual position in the sand and gravel industry.

Start Work on New England Plant of U. S. Gypsum Co.

SURVEYS are being made and construction will start in the near future on the new $2,000,000 plant for the United States Gypsum Co. of Chicago, Ill. An important part of the plant will be the new docks, as all raw material will be brought in by boat from the Canadian mines of the company. This material will be unloaded into concrete silos, from which it will be conveyed to the various units of the plant for conversion into finished product.

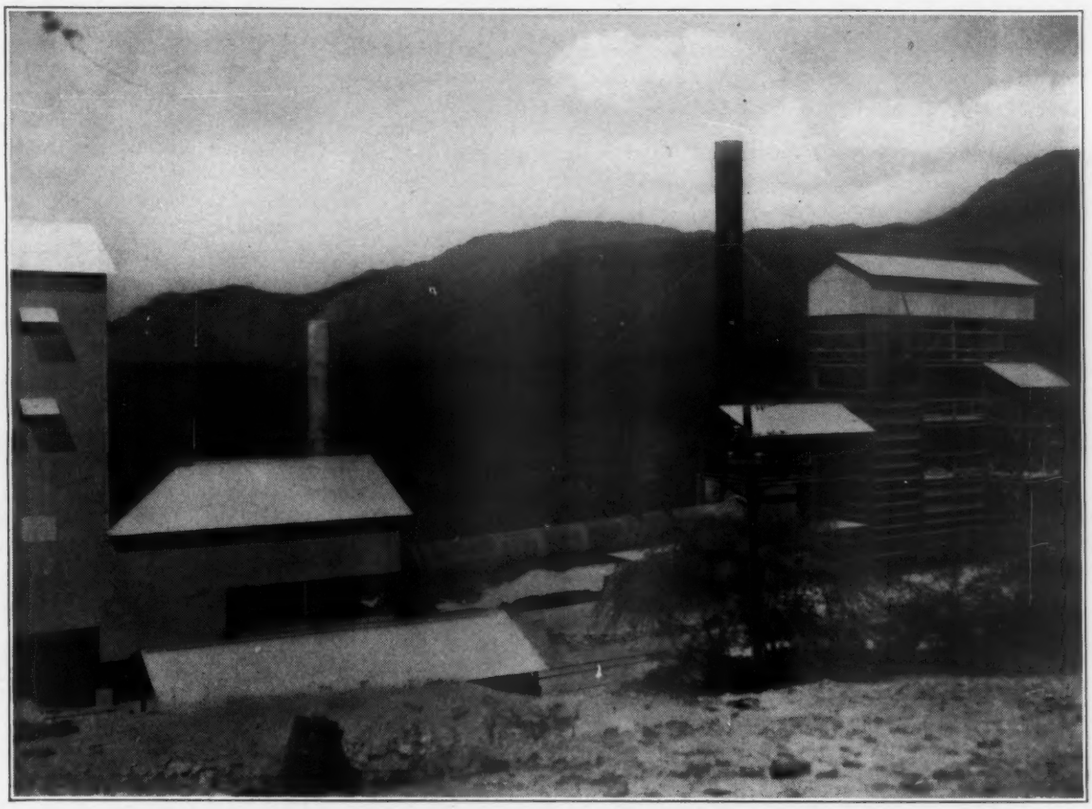
This plant, which will consist of several large buildings of brick and steel, will manufacture a complete line of the company's products, including plaster board and partition blocks, which will be distributed throughout the eastern territory of the company. The plant will be served by sidetracks.

The plant is being designed and built by the Morton C. Tuttle Co., engineers, of Boston, Mass., where the plant is located.

All-Steel Rock and Sand Plant Built in California

AN all-steel rock and sand plant, capable of handling 40 carloads of material per day, has just been completed for the California Materials Co., Los Angeles, Calif., on the Irwindale road, between Baldwin Park and Covina. Approximately 200 tons of structural steel, plate work and machinery supports were involved in the construction.

This new plant, designed for high efficiency, will handle washed sand for cement concrete, fine sand for bituminous concrete and all sizes of crushed rock for paving, buildings and general construction, as well as all grades of washed screened gravel.—*Los Angeles* (Calif.) *Examiner.*



Allis-Chalmers 30 Ton Capacity Rotary Kiln Hydrated Lime Plant

Rotary Kiln Lime Plants

Allis-Chalmers Rotary Kiln Lime Plants designed to meet local conditions are adaptable for burning any material which has the correct chemical analysis for lime. Low quarry and plant operating costs, utilization of small sizes of stone and burning under control at all times. These features together with high capacity insure a high-grade product at low cost. Allis-Chalmers design and furnish complete machinery for large or small Rotary Kiln Lime Plants.

Lime Plant Equipment Manufactured by Allis-Chalmers

Gyratory Crushers
Jaw Crushers
Fairmount Crushers
Pulverators
Rotary Screens
Elevators
Rotary Kilns
Rotary Coolers
Hoists
Motors

OTHER PRODUCTS

Electrical Machinery
Condensers
Steam Engines
Steam Turbines
Hydraulic Turbines
Gas Engines
Oil Engines
Blowing Engines
Pumping Engines
Centrifugal Pumps
Mining Machinery
Metallurgical Machinery
Crushing Machinery
Cement Machinery
Flour Mill Machinery
Saw Mill Machinery
Air Compressors
Steam and Electric Hoists
Tractors
Power Transmission Machinery
Timber Preserving Machinery
Texrope Drives

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

International Cement Buys One Phoenix and the Warrior Plants

ROCK PRODUCTS has been authorized to publish the following statement:

The International Cement Corp. announces the purchase of the Phoenix Portland Cement Co., whose plant is located in Nazareth, Penn., and the Warrior Cement Corp., whose plant is located at Demopolis, Ala. These additions to the International system bring the number of plants comprising the system to a total of 13, and the total annual productive capacity to 20,000,000 bbl. The Nazareth plant will be operated by the Lone Star Cement Co. of Pennsylvania a subsidiary of the International Cement Corp., whose principal office will be located in Philadelphia. The Warrior plant will be operated by the Alabama Portland Cement Co., the International subsidiary which now operates the plant at Birmingham; the Warrior plant to be known as Plant No. 2 and the Birmingham plant to be designated as Plant No. 1.

H. Struckmann, president of the International Cement Corp., is president of both the Alabama and Pennsylvania subsidiaries. The other officers of the Lone Star Cement Co. of Pennsylvania include C. L. Hogan, vice-president; H. H. Muehlke, secretary and treasurer; D. S. MacBride, manager. The other officers of the Alabama Portland Cement Co. include J. W. Johnston, vice-president and manager; C. C. Duff, treasurer; H. H. Muehlke, secretary, and R. M. Walker, sales manager.

The 13 mills which now comprise the International system are operated by 11 subsidiary companies, the stock of which is owned in whole or in major part by the International Cement Corp. Besides the mills at Birmingham, Demopolis and Nazareth, the International system includes a plant at Hudson, N. Y., serving the New York-New England market; one at Greencastle, Ind., serving the Central West; one at Kansas City, Kan., serving the West; the Norfolk mill, serving Virginia and adjacent states; a plant at New Orleans and two mills located at Dallas and Houston, serving Texas and the Southwest; in addition to plants in Cuba, and Uruguay and Argentina.

In announcing the purchase of these plants, Mr. Struckmann said:

"With the acquisition of the mills at Nazareth, Penn., and Demopolis, Ala., the International system now serves the entire territory east of the Rocky Mountains, in addition to Cuba and Uruguay and the Argentine in South America. With its present total productive capacity of 20,000,000 bbl., the International system now ranks among the largest cement producers in the world.

"The growth of the International system in less than a decade from a single local company to an organization which serves two continents has proceeded according to a basic plan which the locations of the International mills have been selected in proximity to large consuming markets and abundant supplies of excellent raw materials. Under this basic plan the factor of variation in business conditions in different parts of the United States has been comprehended and the International mills are all located in sections no two of which are dependent for their prosperity upon the same set of economic or business conditions. In this manner the effect of business depressions local to any one community is minimized.

"The seasonal trend in cement consumption is also comprehended in this basic plan. In the North the season is necessarily shorter than in the South. The International Cement Corp. has northern and southern mills, as well as its Cuban and South American properties. Because of this far-flung distribution of its mills, the effect of seasonal consumption is reduced to nominal proportions.

"The domestic mills of the International system have been so located that if one mill is confronted by an emergency demand for cement that it is unable to meet, another adjacent International mill can quickly come to its assistance, thus assuring uninterrupted service to cement users no matter how great the emergency."

All of the International subsidiaries will also distribute "Incor" cement, a newly perfected portland cement which makes possible concrete of assured permanence that is ready for use in 24 hours.

[Warrior Cement Corp.'s plant at Demopolis was described in detail in ROCK PRODUCTS, issue of August 20, 1927.—Editor.]

Roquemore Gravel Co. Builds Florida Plant

THE Roquemore Gravel Co., which operates the largest plant in the South, near Montgomery, Ala., is building a large capacity plant in Florida just over the line from Flomaton, Ala. It will be all-steel construction and the first really modern large scale plant to operate in Florida.

The plans have been made by F. M. Welch, chief engineer of the Greenville Gravel Corp. and head of the F. M. Welch Engineering Service, and it is the third plant which he has designed for this company. This will be a dredging operation and the pump discharge will be dewatered and then lifted to the top of the plant by a balanced skip hoist.

New Ohio Gravel Plant

THE MIAMI GRAVEL CO., Huntington, W. Va., is constructing a gravel washer on its property near Richmondale, Ohio, and located on the Sciota river. The company recently acquired a lease on gravel property across the river and, according to reports, contemplate transporting the gravel across the river by cable where it will be washed and loaded at the B. & O. and C. & O. tracks.—*Chillicothe* (Ohio) *Sciota Gazette.*

California Sand and Gravel Companies Form Merger

A MERGER representing $6,500,000 was recently made by two rock products and buildings materials concerns, well known throughout the United States, the Consumers Rock and Gravel Co. and California Materials, Inc.

Both have been operating in Los Angeles and various sections of southern California for more than 15 years. The consolidation will operate under the name of Consumers Rock and Gravel Co. The combined output of the two companies is estimated to exceed 4,000,000 tons of rock products per year.

Operations of the Consumers companies are centered in San Fernando Valley around their main crushing plant at Roscoe, and its distributing stations serve a territory extending from Santa Barabara to the Mexican border. California Materials, Inc., has concentrated its activities in the San Gabriel Valley surrounding Whittier. It recently completed and placed in operation a large crushing plant at Irwindale, near Baldwin Park, said to be one of the finest in the west.

The Consumers company operates seven plants, 23 crushers, 11 distributing stations, six batching bunkers, 11.1 miles of its own railroads, 16 locomotives, 50 railroad cars and employs about 500 men. California Materials, Inc., has a quarry in Sycamore Canyon, a large distributing, storage and warehouse depot at Whittier and a comprehensive system of railroad yards at the new Irwindale plant, making direct connections with the main lines of the Southern Pacific and Pacific Electric. Consumers also uses Southern Pacific and Pacific Electric for shipments throughout the southland.

A. H. Gregg, president, and John D. Gregg, general manager, represented California Materials, Inc., in closing negotiations with the Consumers Rock and Gravel Co., represented by A. J. Ginoux, president; F. F. Gay, vice-president; F. J. Gay, secretary, and Frank Gautier, general manager.

Celite Products Co. Expands

THE CELITE PRODUCTS CO., Los Angeles, Calif., has purchased the plant and property of the National Magnesia Manufacturing Co., Redwood City, Calif. The business of the latter company will continue under the name of the National Magnesia Co.

The plant of the Celite company is located at White Hills, Calif., and is said to be the largest plant in the world engaged in the manufacture of diatomaceous earth products (including heat-insulating materials, filter-aids, admixtures for concrete and many grades of mineral fillers). The business at Redwood City includes the manufacture of magnesia, asbestos and diatomaceous earth insulating materials. This business will be continued and the scope of its service will be enlarged.

Residence—Mrs. Marie B. Withington, 420 Brown Street, Jackson, Michigan

Russell Wolcott, *Architect*, Chicago, Ill.

North-Moeller Co., *Contractors*, Jackson, Mich.

Acme Concrete Building Tile by Acme Concrete Products & Gravel Co., Cement City, Mich.

Portland Cement Stucco Exterior

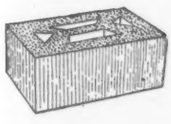
Beauty that Lasts

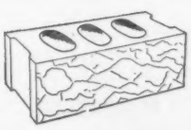
---and it came out of a gravel plant

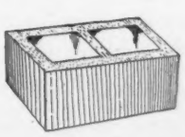
Such pretentious homes as this are being built of concrete wall units. Architects are using lightweight concrete tile for schools, churches, libraries. Concrete blocks are utilized in industrial buildings. Skyscrapers have concrete slab partitions.

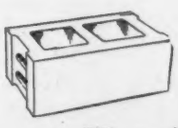
Concrete building units are showing themselves above grade!

No other building material ever enjoyed such a rapidly increasing demand. Today, concrete block, brick and tile are manufactured to definite standards in well financed, well equipped, well managed plants.









There's an Opportunity at *Your* Door

Many prosperous concrete products plants are operated by sand, gravel and crushed stone producers. They are not side-line enterprises. They are well organized factories in which the aggregate producer has a heavy interest.

Our business is the design and equipment of concrete products plants. Will you let our engineers explain to you what opportunity exists in your territory for an enterprise that will fit in well with your present business?

Consolidated
Concrete Machinery Corpn.

ADRIAN, MICHIGAN

News of All the Industry

Incorporations

Webb Building Supply Co., Hoquiam, Wash., capital $5000; Jay M. Webb and Ethel Y. Webb.

Nashville Breeko Block and Tile Co., Nashville, Tenn., increased capital, $20,000 to $30,000.

Anderson Stone Co., Fort Smith, Ark., incorporated; H. C. Bass.

Texas Silica Co., Houston, Texas, capital $24,000, incorporated; Frank Cavenagh.

Rock Quarry Co., Quincy, Mass., $35,000; 350 shares, $100 each. Otto Winquist, John Winquist and Waino Helin, all of Quincy.

Herzog Lime and Stone Co., Forest, Ohio, 2500 shares, preferred $100, 5500 shares no par. F. Cramer, J. D. Miller, B. Herzog.

Fresh Water Sand and Gravel Co., Ltd., Vancouver, B. C., $250,000; dealers in sand, gravel and other building materials.

Nelson Island Lime Co., Ltd., Vancouver, B. C., $75,000; stone merchants, building material dealers, road and pavement makers.

Conard-Kuhn Concrete Co., Columbus, Ohio, 100 shares, $50; 100 shares preferred, $50; Herbert R. Kuhn.

Kentucky Shearman Concrete Products Co., Frankfort, Ky., capital $60,000, incorporated. L. W. Morris, J. B. Blaton and W. D. Nicol.

Cincinnati Sand and Gravel Co., Cincinnati, Ohio, 10,000 shares no par, 6000 shares preferred $100. H. Donnelly, W. Reehl, F. H. Kunkel.

Oil City Sand and Gravel Co., Oil City, Penn.; capital $100,000. Capt. Charles A. Smith, Blawner, Penn., is manager.

Schubert Brothers, Inc., Granville, N. Y., capitalized at $25,000, to engage in manufacture of roofing slate. L. R. Carpenter, Granville, is a stockholder and director.

The Duntile Products Co., Inc., has been chartered in South Washington, Va., with a capital of $50,000, by John A. Van Doren of Cherrydale, Walter B. Eitzel, Chevy Chase, Md., and others.

American Bentonite Corp., Chicago, Ill., capital $500,000. Acquire mining rights, mines, quarries, operate same. O. W. Smith, O. W. Smith, Jr., J. B. Ott, all of Chicago.

The Sand and Gravel Co. of Tama, Iowa, has been incorporated with a capital stock of $100,000. W. M. Poole is president and W. W. Wilson is secretary.

The Great Lakes Gravel Co., 1902 First National Bank building, Detroit, Mich., has been incorporated with a capital stock of $200,000 preferred and 20,000 shares of common at $5 per share.

The Graham Concrete Agitator Co., Inc., has been chartered in Richmond, Va., with a capital stock of $10,000, by O. T. Graham, 4 North Colonial avenue, and others.

Independent Gravel Co., Terre Haute, Ind., capital stock $10,000; production and sale of gravel and sand. Emma K. Loyd, L. J. Loyd, R. R. Pennington.

Lockport Stone Co., Inc., Lockport, N. Y., capitalization $20,000, $100 par value. H. D. Suitor, R. A. Knowles, F. C. Wisbaum, all of Niagara Falls, N. Y.

Florida Lime Products Co., Marianna, Fla., 100,000 shares, no par value; deal in lime, rock and all minerals. J. C. Corcoran, D. P. Daniel and C. A. Robinson.

Marlbrook Lime and Stone Corp., Roanoke, Va., $10,000-$150,000. W. P. Huff, president; I. E. Redmondson, secretary, and C. C. Nelms, all of Roanoke.

John F. Kleist Sand and Gravel Co., Inc., Milwaukee, Wis. To deal in sand, gravel, stone, etc.; 500 shares at $100 each. J. F. Kleist, W. Richter, J. A. Krause.

A. and K. Builders' Supplies, Inc., Jamestown, N. Y.; sand, gravel, etc.; 2000 shares common, no par value. Alvin M. Anderson and Allen E. Bargar of Jamestown, N. Y.

Quarries

J. O. Moors has purchased a granite quarry near Culverton, Ga., which he will open shortly.

City Rock Quarry of Bethay, Mo., recently reopened and is being operated by Wilson and Sutton of Bethay.

Auxvasse Rock Quarry, south of Auxvasse, Mo., is reported reopened to produce material for local roads and city paving.

Gaffney, S. C.—Deposits of a dark blue limestone, located near Gaffney, and estimated as containing 10,000,000 tons, are soon to be developed, according to reports.

The Weyerhaeuser Timber Co., Kelso, Wash., recently received a large rock crusher which will be installed in the vicinity of Hemlock Pass, Wash. The crushing plant when in operation will produce from 300 to 400 yd. of crushed rock per shift to be used as ballast on logging tracks.

Southridge, Mass.—The stone crushing plant recently purchased by the town is reported to be ready for operation. The plant has a capacity of 150 tons of stone per day and will crush gravel for use on the streets of the town.

Sand and Gravel

The L. G. Everist Co., Hawarden, Iowa, is having a new sand and gravel plant constructed.

Toledo, Peoria and Western Railway has received machinery for its new gravel plant at East Peoria, Ill.

Peerless Flint Gravel Co., Wichita, Kan., has recently moved its headquarters from the Wheeler-Kelly-Hagny building to the Brown building.

Arkadelphia Gravel Co., Arkadelphia, Ark., has recently started operation of its new gravel plant and is reported to be running on a full time basis.

The Coast Rock and Gravel Co., San Francisco, Calif., is occupying new quarters at 1000 Hunter Dulin building.

The Zeller Concrete Materials Co., Watertown, S. D., has installed new equipment for its sand and gravel plant, including a hydraulic dredge.

McGeorge Gravel Co., Marshfield, Ore., has recently received a $100,000 contract from the Oregon state highway commission for furnishing 42,600 yd. of gravel for use on the highways.

Island Sand and Gravel Co., Columbus, Ohio, has acquired the Greenlawn Gravel Co. of Columbus. According to reports, several thousand dollars are to be expended for the installation of new equipment.

Blue River Sand and Gravel Co., Blue Rapids, Kan., lost its Diesel-driven dredge recently. The loss is estimated at $18,000. Cause of fire is not given, but the rapid burning of the dredge came from the timber being soaked with oil. The company only began operating this season.

Cement

Lehigh Portland Cement Co.'s plant at Mason City, Iowa, has completed improvements and resumed operations.

Colorado Portland Cement Co., Red Buttes, Wyo., which has been idle for some time, is reported to be now crushing rock for the company's new mill at Fort Collins, Colo.

Beaver Portland Cement Co., Portland, Ore., recently installed new equipment at its plant at Gold Hill, Ore., to enable the loading of cement directly from the mills to the railroad cars in bulk.

Monolith Portland Cement Co., Monolith, Calif., is reported, expects to have its new cement plant at Laramie, Wyo., in operation this summer. The new plant is said to be about three-fourths completed.

Cement Products

The Eugene Concrete Pipe Co., Eugene, Ore., is about to erect a $1000 warehouse.

Gonzales Cement Works, Gonzales, Texas, reported being moved to San Antonio, where its founder, A. O. Neumann, recently established a similar plant. It is said that the two will be consolidated.

The United Concrete Pipe and Construction Co. has begun construction of a corrugated iron warehouse at Wilmington, Calif., to cost about $1000.

Sholto Vickers, Midland, Texas, is to engage in the manufacture of concrete hollow tile.

Fairbank Block and Supply Co., Ltd., have completed an addition to their factory at Toronto, Ont. Their present capacity is from 5000 to 6000 cement blocks in eight hours. They have secured the Cordery patent rights in Canada to manufacture "Cinderblox" made of cinders and cement.

Gypsum

American Gypsum Co., Port Clinton, Ohio, is reported to have a $3,000 loss due to damage done recently by fire in a frame stock house.

Certain-Teed Products Corp., New York City, is planning increased production at the plant of the Beaver Board Co., Inc., Buffalo, N. Y.

Personals

S. H. Sutton

Seymour H. Sutton recently joined the pump department of the American Manganese Steel Co. He was formerly associated with the Erie Pump and Engine Works.

Wallace E. Wing, chemist for the Marblehead Lime Co., has been transferred from the Chicago plant to the Hannibal, Mo., plant of the company.

George Thomas Wade, superintendent of the hydrate mill of the Rockland and Rockport Lime Corp., Rockland, Maine, retired recently after 25 years of active service as superintendent.

J. E. Zahn, secretary of the United States-Cement Co., Denver, Colo., has been elected vice-president of the Denver Chamber of Commerce, department of finance.

Fred Shieber, superintendent of the Portland Cement Co., plant at Montevideo, Uruguay, and his wife, recently returned to Montevideo after a visit with relatives in Garnet, Kan.

Walter Jahncke, of the Jahncke Service Co., New Orleans, La., has been elected a member of the board of governors of the Home Modernizing Bureau of the National Building Industries.

J. Foster Cook, for several years special representative of the Hermitage Portland Cement Co., Nashville, Tenn., recently resigned his position to become associated with the Martin A. Hayes Co., Nashville, general agents for the Standard Accident Insurance Co., Detroit, Mich.

O. A. Scott, salesman for the National Lime and Stone Co., in northwestern Ohio, is reported to have severed his connections with that company and will enter the field of road construction and maintenance. Mr. Scott will operate under the name of the Highway Materials Co., with temporary offices located at 416 Lima avenue, Findlay, Ohio.

Obituaries

Albert Smith, superintendent of the Port Deposit, Md., plant of the General Crushed Stone Co., died suddenly on April 27 at Port Deposit. He is survived by his widow.

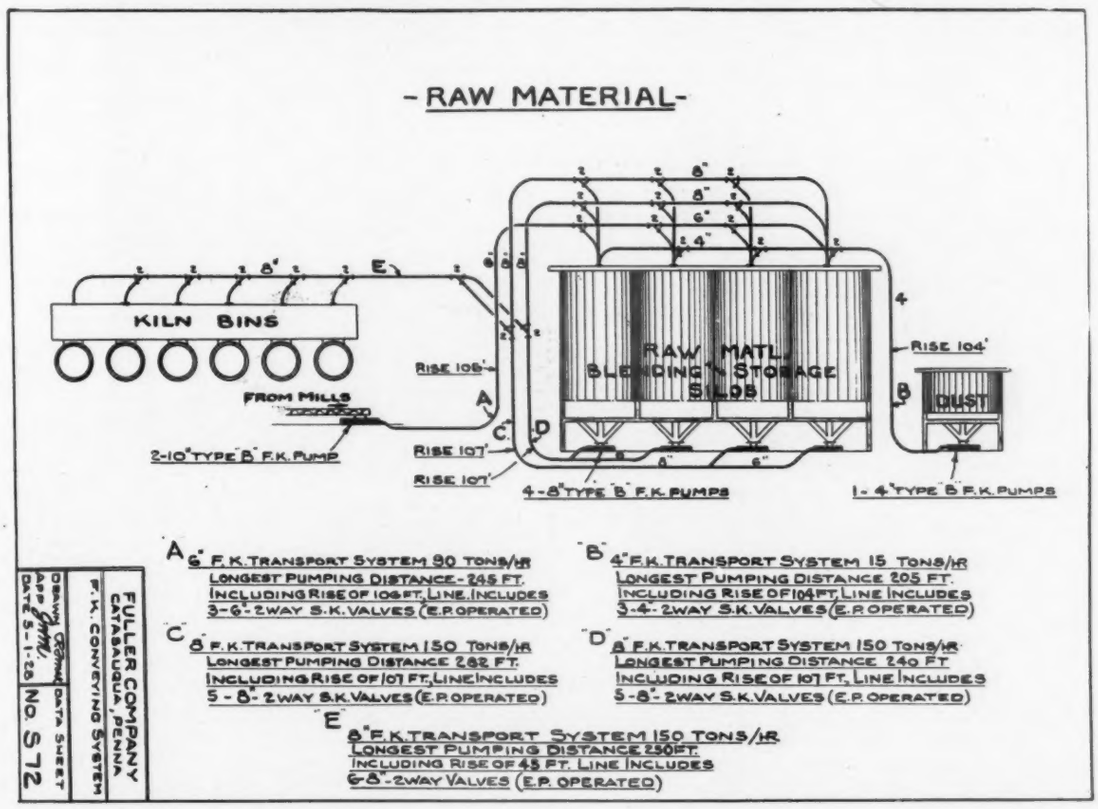
James J. Wood, consulting engineer of the Fort Wayne works of the General Electric Co., and one of the pioneers of electric lighting by arc lamps in America, died suddenly April 19, 1928, at Asheville, N. C., from heart disease.

George Vest Bush, Rogers City, Mich., died in Chicago, Ill., April 9, 1928, after an illness of several months. Mr. Bush was 45 years old. For the past 15 years he was employed as quarry superintendent for the Michigan Chemical and Limestone Quarry Co., Rogers City, Mich.

DRY CEMENT RAW MATERIAL MIXING AND BLENDING

A TIMED AUTOMATIC AND REMOTELY CONTROLLED ADAPTATION OF THE

FULLER KINYON CONVEYING SYSTEM


- RAW MATERIAL -
KILN BINS
FROM MILLS
2-10" TYPE B F.K. PUMP
RISE 105'
RISE 107'
RISE 107'
RAW MATL. BLENDING & STORAGE SILOS
4-8" TYPE B F.K. PUMPS
RISE 104'
DUST
1-4" TYPE B F.K. PUMPS
A 6" F.K. TRANSPORT SYSTEM 90 TONS/HR LONGEST PUMPING DISTANCE - 245 FT. INCLUDING RISE OF 105 FT. LINE INCLUDES 3-6"-2 WAY S.K. VALVES (E.P. OPERATED)
B 4" F.K. TRANSPORT SYSTEM 15 TONS/HR LONGEST PUMPING DISTANCE 205 FT. INCLUDING RISE OF 104 FT. LINE INCLUDES 3-4"-2 WAY S.K. VALVES (E.P. OPERATED)
C 8" F.K. TRANSPORT SYSTEM 150 TONS/HR LONGEST PUMPING DISTANCE 262 FT. INCLUDING RISE OF 107 FT. LINE INCLUDES 5-8"-2 WAY S.K. VALVES (E.P. OPERATED)
D 8" F.K. TRANSPORT SYSTEM 150 TONS/HR LONGEST PUMPING DISTANCE 240 FT. INCLUDING RISE OF 107 FT. LINE INCLUDES 5-8"-2 WAY S.K. VALVES (E.P. OPERATED)
E 8" F.K. TRANSPORT SYSTEM 150 TONS/HR LONGEST PUMPING DISTANCE 250 FT. INCLUDING RISE OF 45 FT. LINE INCLUDES 6-8"-2 WAY VALVES (E.P. OPERATED)
FULLER COMPANY CATASAUQUA, PENNA
F.K. CONVEYING SYSTEM
DATA SHEET
NO. S 72
DRAWN
APP.
DATE 5-1-28

The specific application of the Fuller-Kinyon Mixing and Blending System shown in the schematic diagram is particularly complete and flexible in control. Each of the systems, their branches and interconnected lines is under complete timed automatic control, subject to modification by remote control. The automatic control distributes the mill stream to each silo bin for a short interval to spread the variation and to form thin, flat layers of material in each bin, which run together and mix during withdrawal, due to the piping or ratholing effect above the several discharge spouts. Withdrawn materials are recirculated to storage and are intermittently delivered to the kiln bins in similar sequences to effect further mixing, delivery to the kiln bins automatically alternating from the first two and the second two silo bins. Flue dust is also distributed in similar intermittent sequence. The operation of the distributing valves above the silos is synchronized so that the mill stream load, the two circulating loads and the flue dust are delivered to the same bin at the same time to cause mixing by turbulence of the discharging streams.

Several of these systems are in continuous service and have conclusively demonstrated that a more uniform high quality cement can be made by the dry process, with a minimum of supervision and at the same or lower cost.

FULLER COMPANY ~ ~ CATASAUQUA, PA.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 160

Adamite (Castings)
Mackintosh-Hemphill Co.

Aerial Wire Rope Tramways
American Steel & Wire Co.
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.

Agitators, Thickeners and Slurry Mixers
The Dorr Co.
Hardinge Co., Inc.
Hetherington & Berner, Inc.
Morris Machine Works
Polysius Corp.
F. L. Smidth & Co.

Air Compressors
Ingersoll-Rand Co.
Pennsylvania Pump & Compressor Co.
Sullivan Machinery Co.
Traylor Eng. & Mfg. Co.

Air Filters
Dust Recovering & Conv. Co.

Air Line Oilers
Gardner-Denver Co.
Hardsocg Wonder Drill Co.

Air Pumps
Fuller Lehigh Co.

Air Separators
Dust Recovering & Conv. Co.
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Kent Mill Co.
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Sturtevant Mill Co.
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Koehring Co.

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Webster Mfg. Co.

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Hyatt Roller Bearing Co.

Bearings (Collar Oiling)
Hyatt Roller Bearing Co.

Bearings (Tapered Roller)
Hyatt Roller Bearing Co.

Bearings (Thrust)
Hyatt Roller Bearing Co.

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Goodyear Tire & Rubber Co., Inc.
Robins Conveying Belt Co.
F. M. Welch Eng. Serv.

Bins (Cement, etc.)
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Burrell Eng. & Const. Co.
Galland-Henning Mfg. Co.
Hetherington & Berner, Inc.
Traylor Eng. & Mfg. Co.
Universal Crusher Co.
Webster Mfg. Co.

Bin Gates
Austin Mfg. Co.
R. H. Beaumont Co.
Easton Car & Construction Co.
Fuller Lehigh Co.
Galland-Henning Mfg. Co.
Gruendler Patent Crusher & Pulv. Co.
Industrial Brownhoist Corp.
Link-Belt Co.
Richardson Scale Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.

Blast Hole Drills (See Drills)

Blasting Accessories
Hercules Powder Co.

Blasting Machines
Hercules Powder Co.

Blasting Powder
Hercules Powder Co.

Block Machines (Concrete)
Consolidated Concrete Machinery Corp.
W. A. Riddell Co.

Blocks (Brake & Friction)
The Mikesell Company

Blocks (Pillow)
Hyatt Roller Bearing Co.

Blocks (Sheave)
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Sauerman Bros.

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Northern Blower Co.

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Easton Car & Construction Co.

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The Mikesell Company

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Komnick Machinery Co., Inc.

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Brick Machinery (Sand Lime and Slag)
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Dr. Bernhardi Sohn

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Buckets (Dragline and Slackline)
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Page Engineering Co.
Sauerman Bros.
Street Bros. Machine Wks.
G. H. Williams Co.

Buckets (Elevator and Conveyor)
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Hayward Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
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Manganese Steel Forge Co.
Polysius Corporation
Robins Conveying Belt Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
W. Toepfer & Sons Co.
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Blaw-Knox Co.
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Link-Belt Co.

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Bethlehem Steel Co.
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Classifiers
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Conveyors and Elevators
Austin Mfg. Co.
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Chain Belt Co.
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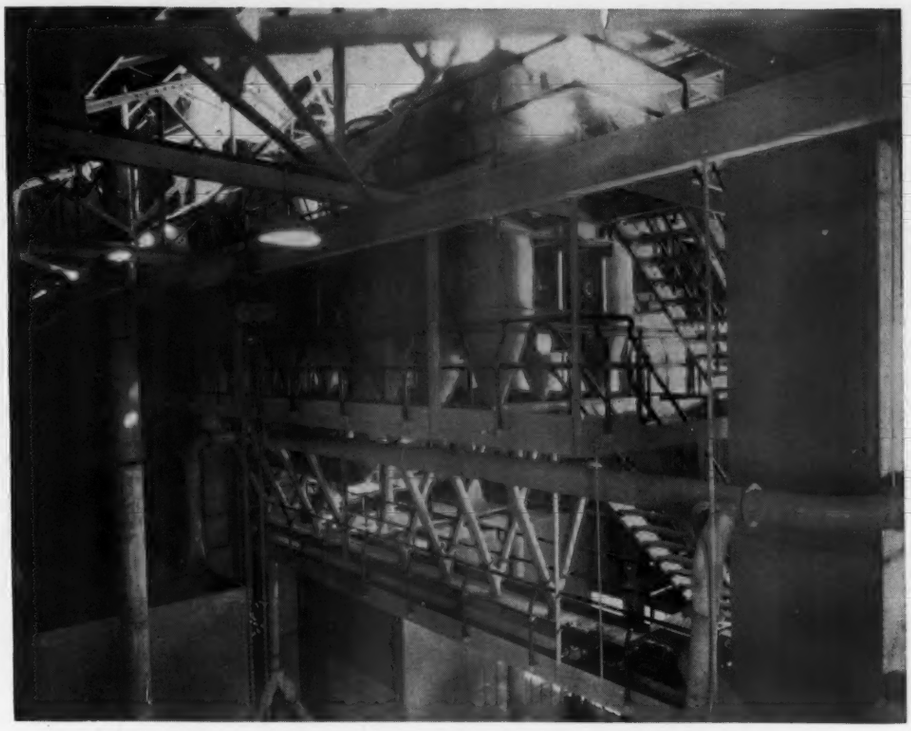
DRACCO DOES IT



OPERATORS of industrial plants everywhere are united in the belief that cleanliness and order tend to increase the efficiency of labor and equipment. Particularly is this true in plants where dusty materials are handled or produced.

To secure and maintain conditions of cleanliness and good order in cement plants, the DRACCO Dust Collecting System is essential equipment. Just glance at the illustration above and judge for yourself what the DRACCO System is already doing toward taking the dust nuisance out of cement plant operation. The picture shows the DRACCO System installed on finish grinding mills and conveyors. The interior of the plant is entirely free from dust—the DRACCO System thus accomplishing the three-fold result of preventing dust losses, protecting costly equipment and improving working conditions.

The DRACCO System not only collects the dust, but discharges it automatically. Let us send you complete information.

The Dust Recovering & Conveying Company

Fume Recovery
Dust Collecting
Pneumatic
Conveying

Engineers and Manufacturers
CLEVELAND, OHIO

Equipment
Engineering
Consultation

DRACCO

Dust Collecting Systems

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Conveyors and Elevators (Cont.)
Fuller Co.
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Hayward Co.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Lewistown Fdy. & Mach. Co.
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Manganese Steel Forge Co.
Polysius Corporation
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Universal Road Machinery Co.
Webster Mfg. Co.
F. M. Welch Eng. Serv.

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Core Drilling (See Drills—Diamond Core)

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Chain Belt Co.
Falk Corp.
Fons Flexible Pipe Coupling Co.
Philadelphia Gear Works

Couplings (Hose, Pipe, etc.)
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Cranes (Crawler and Locomotive)
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Browning Crane Co.
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Harnischfeger Corp. (Pawling & Harnischfeger)
Industrial Brownhoist Corp.
Insley Mfg. Co.
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Ohio Locomotive Crane Co.
Thew Shovel Co. (Electric, Gasoline & Steam)

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Harnischfeger Corp. (Pawling & Harnischfeger)
Hayward Co.

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Harnischfeger Corp. (Pawling & Harnischfeger)

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Dixie Machinery Mfg. Co.
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Sturtevant Mill Co.

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Elevator Buckets (See Buckets—Elevator)

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Dust Recovering & Conv. Co.

Fire Brick
General Refractories Co.

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Ingersoll-Rand Co.

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Davenport Loco. & Mfg. Co.
Manganese Steel Forge Co.

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L. B. Foster Co.
Morrison & Risman Co., Inc.

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B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co., Inc.

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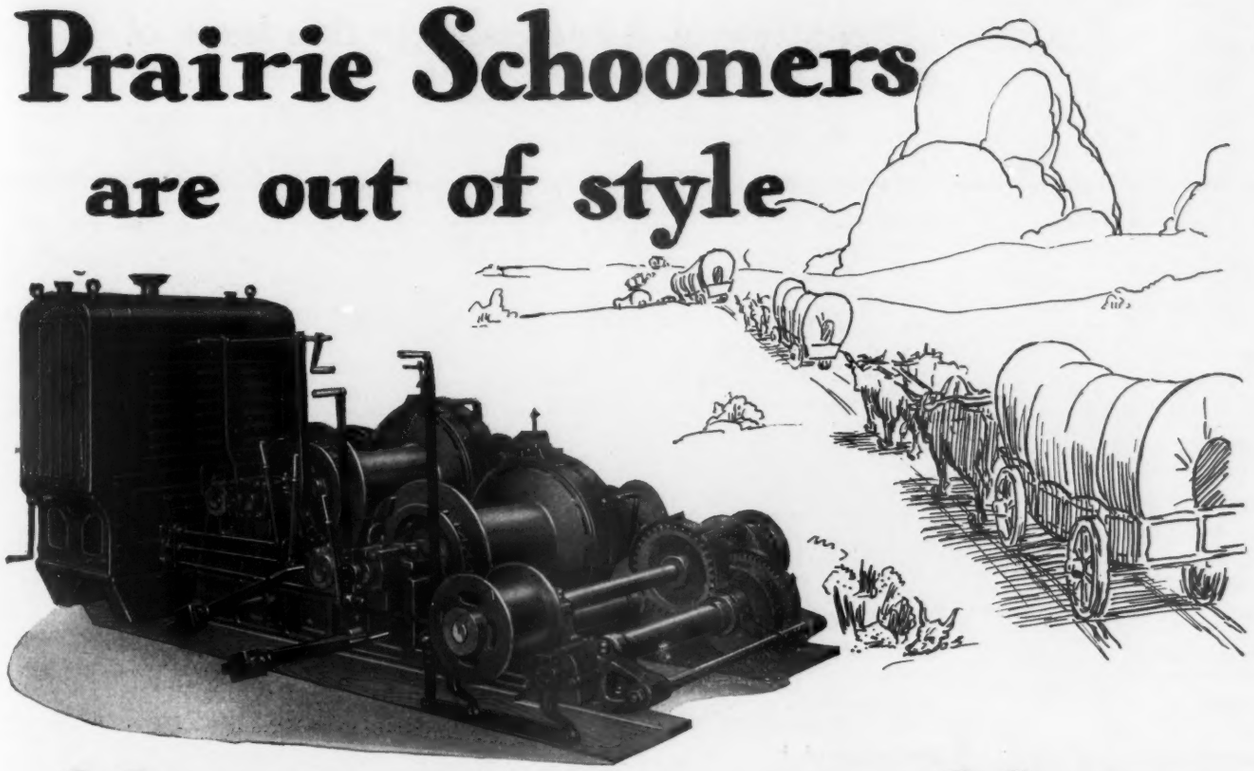
Gasoline Tanks (See Tanks—Gasoline)

Gas Producers
R. D. Wood & Co.

Gears (Machine Molded)
Vulcan Iron Works

Gears (Spur, Helical, Worm)
Cleveland Worm & Gear Co.
Falk Corp. (Helical)
Jeffrey Mfg. Co.
R. D. Nuttall Co.
Philadelphia Gear Works
Palmer-Bee Co.

Prairie Schooners are out of style



likewise are one-speed hoists

TRADE MARK MUNDY ESTABLISHED 1869

To Equipment Distributors

The New Patent Three-Speed Hoist is fully protected by patents in the United States and Canada.

Some open exclusive sales territory is now available.

PROGRESS is eternal. . . . Faster!. . . More speed! These are the demands of modern business. The "prairie schooner" served well in the "days of '49", but it would hardly compete with the fast, comfortable methods of present-day travel. Its passing was inevitable.

In hoisting equipment too, there has been progress. Here, as in transportation methods, the demand has been *more speed.* The past century saw the passing of the "prairie schooner" This century sees the single-speed hoist following. Both were too slow.

Time is too valuable in this age for a hoist with the narrow limits of performance that go with a single speed.

The Mundy Patented Three-Speed Hoist is the advanced outpost of 20th century hoisting methods. It teaches a lesson in hoisting speed that was never known in the days of the old fashioned single speed machine.

Think of the economies affected by three speeds—all in a single unit'. A different speed for heavy, intermediate and light loads—with instant changes from one to another. Description folder is yours for the asking.

The Mundy Sales Corporation

Distributors for the J. S. Mundy Hoisting Engine Co.

30 Church St., New York

Agents in Principal Cities

MUNDY HOISTS

The Hoist With The Asbestall Frictions

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Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 160

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Mackintosh-Hemphill Co.
Philadelphia Gear Works
Stephens-Adamson Mfg. Co.
Vulcan Iron Works

Gear Reducers
Cleveland Worm & Gear Co.
Falk Corp.
Palmer-Bee Co.
Philadelphia Gear Works

Generators (See Motors and Generators)

Governors (See Engine Governors)

Grab Bucket Cranes (See Cranes)

Grab Bucket Hoists (Monorail) (See Cranes)

Grab Buckets—See Buckets (Grab, Clamshell, etc.)

Graphite Facings
Joseph Dixon Crucible Co.

Grapples
Hayward Co.

Grapples (Stone)
G. H. Williams Co.

Grapples (Wood)
Browning Crane Co.

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Blaw-Knox Co.
Kerlow Steel Flooring Co.

Grease
Joseph Dixon Crucible Co.
Merco Nordstrom Valve Co. (Valve)
Troco Lubricating Co.

Grinding Balls
Fuller Lehigh Co.
Jeffrey Mfg. Co.

Grizzlies
Austin Manufacturing Co.
Lewistown Fdy. & Mach. Co.
Manganese Steel Forge Co.
Robins Conveying Belt Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.

Grizzly Feeders
Polysius Corporation

Guns (Hydraulic)
Georgia Iron Works

Gypsum Plaster Plants
Butterworth & Lowe
J. B. Ehrsam & Sons Mfg. Co.

Gyrating Screens (See Screens)

Hammer Drills
Gardner-Denver Co.
Hardsocg Wonder Drill Co.
Ingersoll-Rand Co.

Hammer Mills (See Crushers)

Hand Shovels (See Shovels)

Hoists
S. Flory Mfg. Co. (Electric, Steam and Gasoline)
Gardner-Denver Co.
Hardsocg Wonder Drill Co.
Harnischfeger Corp. (Pawling & Harnischfeger)
Hayward Co.
Ingersoll-Rand Co.
Link-Belt Co.
Mundy Sales Corp.
Sauerman Bros.
Smith Engineering Works

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Street Bros. Mach. Wks.
Sullivan Machinery Co. (Portable Air, Electric and Steam)
Vulcan Iron Works

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Goodyear Tire & Rubber Co., Inc.

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Kritzer Co.
McGann Mfg. Co., Inc.
H. Miscampbell
Vulcan Iron Works

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General Electric Co.

Insulation (Heat)
General Refractories Co.

Kiln Insulation
General Refractories Co.

Kiln Liners
General Refractories Co.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Bonnot Co.
Hardinge Co., Inc.
McGann Mfg. Co., Inc.
Polysius Corporation
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Vulcan Iron Works

Kilns (Shaft)
McGann Mfg. Co., Inc.
H. Miscampbell
Vulcan Iron Works

Kominuters (See Mills)

Laboratory Crushers
Sturtevant Mill Co.

Lights (Portable Acetylene)
Union Carbide Sales Co.

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Dust Recovering & Conv. Co.
Fuller Co.
Kritzer Co.
Link-Belt Co.
H. Miscampbell
Raymond Bros. Impact Pulv. Co.

Lime and Hydrating Plants
McGann Mfg. Co., Inc.
Vulcan Iron Works

Line Shaft Couplings
Chain Belt Co.
Falk Corp.
Philadelphia Gear Works

Linings (See Mill Liners & Linings)

Linings (Rubber for Ball and Tube Mills)
B. F. Goodrich Rubber Co.

Liquid Oxygen
Keith Dunham Co.

Loaders and Unloaders
Bucyrus-Erie Co.
Consolidated Concrete Machinery Corp.
Dust Recovering & Conv. Co.
Harnischfeger Corp. (Pawling & Harnischfeger)

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Hayward Co.
Jeffrey Mfg. Co.
Link-Belt Co.
G. H. Williams Co.

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Locomotives (Steam, Gas and Electric)
Davenport Loco. & Mfg. Co.
Fate-Root-Heath Co. (Gas)
General Electric Co.
Jeffrey Mfg. Co.
Lima Locomotive Works (Steam)
Plymouth Locomotive Works (Gas)
Vulcan Iron Works

Locomotives (Storage Battery)
Atlas Car & Mfg. Co.
General Electric Co.
Jeffrey Mfg. Co.

Lubricants
Broderick & Bascom Rope Co. (Wire Rope)
Joseph Dixon Crucible Co.
Merco Nordstrom Valve Co. (Valve)
Troco Lubricating Co.
Vacuum Oil Co.

Machinery Guards
Harrington & King Perforating Co.

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Magnetic Mfg. Co.

Magnetos
Eisemann Magneto Corp.

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General Electric Co.

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Manganese Steel Forge Co.

Manganese Steel (Rolled or Forged)
Manganese Steel Forge Co.

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B. F. Goodrich Rubber Co.

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Bonnot Co.
Bradley Pulverizer Co.
Fuller Lehigh Co.
Hardinge Co., Inc.
Jackson & Church Co.
Lewistown Fdy. & Mach. Co.
Mackintosh-Hemphill Co.
Polysius Corporation
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
Fuller Lehigh Co.
Jeffrey Mfg. Co.

Mill Lining (Rubber for Ball and Tube Mills)
B. F. Goodrich Rubber Co.

Mine Development
E. J. Longyear Co.

Mining Engineers (See Engineers)

Molds (Concrete)
Consolidated Concrete Machinery Corp.

Motors (Gasoline)
Climax Engineering Co.
Le Roi Company

Motors and Generators (Electric)
Allis-Chalmers Mfg. Co.
General Electric Co.

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Raymond Bros. Impact Pulv. Co.

Oilers (Air Line)
Gardner-Denver Co.
Hardsocg Wonder Drill Co.

Oil Forges
Gardner-Denver Co.
Hardsocg Wonder Drill Co.

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Vacuum Oil Co.

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McLanahan-Stone Machine Co.

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Goodyear Tire & Rubber Co., Inc.

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Manganese Steel Forge Co. (Rolled Manganese Dredge Pipe)
R. D. Wood & Co.

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Georgia Iron Works

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Blaw-Knox Co.

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Pneumatic Drills (See Drills)

Pneumatic Tools
Ingersoll-Rand Co.

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Hercules Motors Corp.
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Are you getting the most out of the heart of your equipment? Climax engines equipped with the new Automatic Spark Control give you greater power on less fuel. The new spark control prevents spark knocks and reduces wear on the bearings. This new control needs no oiling—no adjustment—no attention. It is hermetically sealed—is fool-proof. The control advances and retards the spark automatically with the varying imposed loads. There is no feverish throbbing of the cylinders—no knocking. As a result Climax engines give you the unrivaled performance of energized ability.

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Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 160

Pulleys (Friction Clutch)
Power Mfg. Co.

Pulleys (Magnetic) (See Magnetic Pulleys)

Pulverizers (See also Crushers, Mills, etc.)
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Bethlehem Steel Co.
Bonnot Co.
Bradley Pulverizer Co.
Dixie Machinery Mfg. Co.
Fuller Lehigh Co.
Gruendler Patent Crusher & Pulv. Co.
Hardinge Co., Inc.
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Kent Mill Co.
Lewistown Fdy. & Mach. Co.
Polysius Corporation
Raymond Bros. Impact Pulv. Co
Sturtevant Mill Co.
Universal Crusher Co.

Pumps (Air Lift)
Fuller Co.
Pennsylvania Pump & Compressor Co.
Sullivan Machinery Co.

Pumps (Cement Slurry)
The Dorr Co.
Fuller Co.
Morris Machine Works
Polysius Corporation
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A. R. Wilfley & Sons

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Allis-Chalmers Mfg. Co.
Bethlehem Steel Co.
Hetherington & Berner, Inc.
Ingersoll-Rand Co.
Morris Machine Works
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Fuller Lehigh Co.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co.
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Hetherington & Berner, Inc.
Morris Machine Works
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E. J. Longyear Co.

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Bethlehem Steel Co.
Easton Car & Construction Co.
L. B. Foster Co.
Morrison & Risman Co., Inc.

Railways (Electric)
General Electric Co.

Railway Equipment
General Electric Co.

Refractories
General Refractories Co.

Road Machinery
Austin Manufacturing Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
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Harnischfeger Corp. (Pawling & Harnischfeger)
Koehring Co.
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Jackson & Church Co.
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Richardson Scale Co.

Scales (Cement)
Richardson Scale Co.

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Austin Mfg. Co.
R. H. Beaumont Co.
Hayward Co.
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Sauerman Bros.
Street Bros. Mach. Wks.

Scraping Hoists
Gardner-Denver Co.
Hardsocg Wonder Drill Co.

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Austin Mfg. Co.
Chain Belt Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
Cross Engineering Co.
Galland-Henning Mfg. Co.
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Jeffrey Mfg. Co.
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Lewistown Fdy. & Mach. Co.
Link-Belt Co.
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McLanahan-Stone Mach. Co.
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Polysius Corporation
Robins Conveying Belt Co.
Simplicity Engineering Co.
Orville Simpson Co.
Smith Engineering Works
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Sturtevant Mill Co.
W. Toepfer & Sons Co.
Traylor Eng. & Mfg. Co.
W. S. Tyler Co.
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Universal Vibrating Screen Co.
F. M. Welch Eng. Service

Separators, Air (See Air Separators)

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Separators (Slurry)
F. L. Smidth & Co.

Shaft Sinking
E. J. Longyear Co.

Sharpening Machines, Drill (See Drill Sharpening Machines)

Shovels (Steam, Gas, Electric, Diesel, Oil)
Browning Crane Co.
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Byers Machine Co.
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Industrial Brownhoist Corp.
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Monighan Mfg. Corp.
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Stephens-Adamson Mfg. Co.
Street Bros. Mach. Wks.
Vulcan Iron Works
F. M. Welch Eng. Service.

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A. Leschen & Sons Rope Co.

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Cleveland Worm & Gear Co.
Falk Corp.
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Sprockets and Chain
Chain Belt Co.
Fuller Lehigh Co.
Jeffrey Mfg. Co.
Philadelphia Gear Works

Steel (Special Alloy)
Bethlehem Steel Co.

Steel Fabrication
H. K. Ferguson Co.

Steel Plate Construction
Hendrick Mfg. Co.

Steel (Structural)
Bethlehem Steel Co.

Steps (Safety)
Kerlow Steel Flooring Co.

Stokers
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Sauerman Bros.

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Consolidated Concrete Machinery Corp.

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Blaw-Knox Co.
The Dorr Co.
Link-Belt Co.
Smith Engineering Works

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The Dorr Co.
Hardinge Co., Inc.

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Consolidated Concrete Machinery Corp.

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Bethlehem Steel Co.

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Atlas Car & Mfg. Co.
Bethlehem Steel Co.
Easton Car & Construction Co.
L. B. Foster Co.

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Caterpillar Tractor Co.

Trailer Cranes (See Cranes)

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Broderick & Bascom Rope Co.
Interstate Equipment Corp.

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Goodyear Tire & Rubber Co., Inc.

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Cleveland Worm & Gear Co.
Hyatt Roller Bearing Co.
Kritzer Co.
Stephens-Adamson Mfg. Co.

Trenchers (Wheel & Ladder Type)
Harnischfeger Corp. (Pawling & Harnischfeger)

Truck Cranes (See Cranes)

Tube Mills (See Mills, Ball, Tube, etc.)

Tube Mill Liners (See Mill Liners)

Tubing (Blasting)
B. F. Goodrich Rubber Co.

Tunnelling Machines
Bucyrus-Erie Co.
E. J. Longyear Co.

Turntables
Easton Car & Construction Co.

Underground Loaders
Bucyrus-Erie Co.
Thew Shovel Co.

Valves
Merco Nordstrom Valve Co. (Lubricated Plug)

Valves (Pump)
B. F. Goodrich Rubber Co.

Vibrating Screens (See Screens)

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
The Dorr Co.
Lewistown Fdy. & Mach. Co.
Link-Belt Co.
McLanahan-Stone Mach. Co.
F. L. Smidth & Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
F. M. Welch Eng. Service

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Merrick Scale Mfg. Co. (Automatic Proportioning)
Richardson Scale Co.
Schaffer Poidometer Co.

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General Electric Co.

Well Drills (See Drills, Well)

Wheels (Car)
Easton Car & Construction Co.
Fuller Lehigh Co.
Vulcan Iron Works

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Mundy Sales Corp.

Wire Cloth
Cleveland Wire Cloth & Mfg. Co.
Manganese Steel Forge Co.
W. S. Tyler Co.

Wire (Manganese Steel)
Manganese Steel Forge Co.

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American Steel & Wire Co.
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.

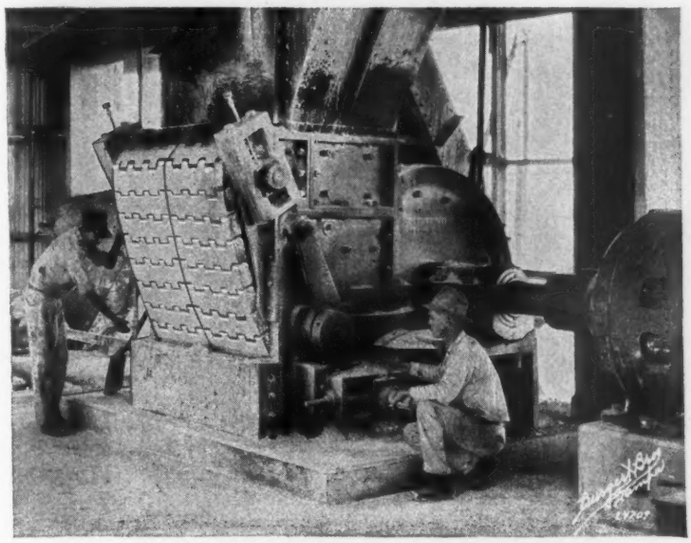
Wire Rope Fittings
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.

Worm Gears (See Gears)

A Moving Breaker Plate

with

26 Times the Wearing Area!



The Dixie Non-Clog Hammermill is so simple in construction that even the most inexperienced operator can make necessary adjustments quickly and easily. The interior is so readily accessible that the size of the finished product may be changed within a few minutes by simply adjusting the breaker plate.

And the special *moving breaker plate* gives twenty-six times the wearing area of any standard type of breaker plate!

Write for complete catalog—*today!*

DIXIE MACHINERY MFG. COMPANY

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40-foot Continuous Bucket Elevator

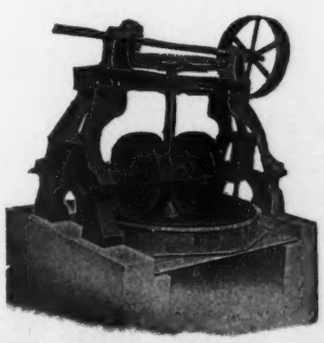
FROM every angle, Lewistown Equipment meets the needs of the average plant. It is reasonably priced, sturdy, and built the best way that years of experience and modern manufacturing facilities will permit. Lewistown units are easily installed, efficient, and economical to operate and maintain.

Tell us your requirements in crushing, grinding, screening, washing, drying and elevating equipment.

Write for Specifications and Prices

Lewistown Foundry & Machine Co.

Lewistown, Pa.



9-foot Dry Pan

12x20-inch Jaw Crusher

The Core Tells the Story

In planning the development of a non-metallic property, you should know in advance the area, depth and contour of the deposit, as well as the quality of the rock. Diamond core drilling is the one certain method of securing these facts for—the rock cores recovered tell the story.

Not only may the quantity of rock be known in advance by drilling the deposit to determine its width, depth and thickness, but the cores representing cross sections of the rock in place may be tested for their physical and chemical characteristics. You may grade and select your stone for specific requirements and keep reserves in proper relation to production.

E. J. Longyear Company will contract to diamond core drill your non-metallic property. Our organization and drilling crews have had many years of experience in such work.

Write us about any contemplated drilling under consideration. There is no obligation.

E. J. Longyear Company
Minneapolis, Minnesota, U.S.A.

SPEED REDUCERS
That Reduce Costs

Reducing the cost of repairs and utilizing power to the utmost are outstanding developments in industrial progress.

Nuttall, as one of the largest and most successful industrial gear manufacturers, has given particular attention to the development of heavy duty gearing and speed reduction units of various types, and the designing of this Speed Reducer was a job for competent engineers with an ample background of experience in heavy duty drives.

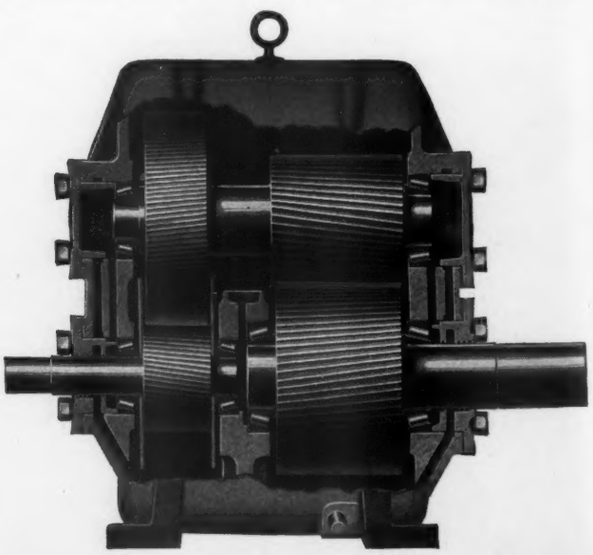
Nuttall Speed Reducers are of the vertical type. In the single reduction Reducers the shafts are parallel and offset in the same vertical plane; in the double reduction reducers, they are concentric. Heat-treated and hardened single helical gears, give great strength and smooth operation. Timken roller bearings assure perfect alignment and unparalleled dependability. A rigid, reinforced case and the Nuttall system of positive splash lubrication are all combined to give a Speed Reducer of unexcelled strength, simplicity and a reliability of operation.

Send for our Speed Reducer Bulletin No. 59

R. D. NUTTALL COMPANY, Pittsburgh, Pa.

All Nuttall Products are sold through the Westinghouse Electric & Mfg. Co., district offices. Refer your inquiries to the nearest Westinghouse Office.

Lyman Tube & Supply Co., Montreal, Toronto, Vancouver, Can.



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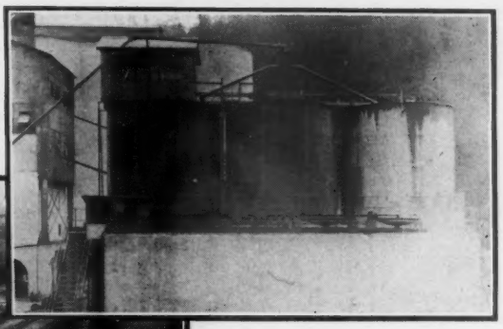
AGITATORS for CEMENT SLURRY

Mechanical and Air Agitation

CORRECTING BASINS



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STORAGE BASINS

F. L. SMIDTH & CO.

(Inc. 1895)

ENGINEERS

DESIGNERS AND EQUIPPERS OF CEMENT MAKING FACTORIES

Factory, Foundry and Laboratory—Elizabeth, N. J.

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Two Unit Grinding via the Improved HERCULES

FOR double unit reduction of cement clinker and raw materials, greatly increased grinding efficiency is obtained by the use of Bradley Hercules Mills. By using the Hercules as the preliminary machine, an ideal tube mill feed is made possible—with a corresponding increase in output and a higher and more uniform fineness of product.

Furthermore, with this combination of grinding mills, these results are obtained with a remarkably small amount of power. Let us tell you how the Hercules may be profitably adapted to your own grinding problems.

For grinding asphalt filler, agricultural limestone, coal, gypsum, and all other non-metallic minerals, investigate the
GRIFFIN MILL,
BRADLEY THREE ROLL MILL, and
BRADLEY PNEUMATIC MILL—
all of which are widely used for these purposes.

BRADLEY PULVERIZER COMPANY

Boston — London — Works: Allentown, Pa.

Dependability

Few moving parts, direct transmission, gives free flowing power. Symmetrical design brings balanced pressure on all bearings. For lubrication a film of oil continuously carried up on the working faces of the gears. The same oil going through the bearings floods the shaft bearing surfaces. Falk Speed Reducers, precision built, have been giving dependable service on heavy duty for 12 years. They are now available for all industrial requirements at new prices made possible by standardized production.

Bulletin No. 160, containing rating tables, full dimensions, with complete price list, sent on request.

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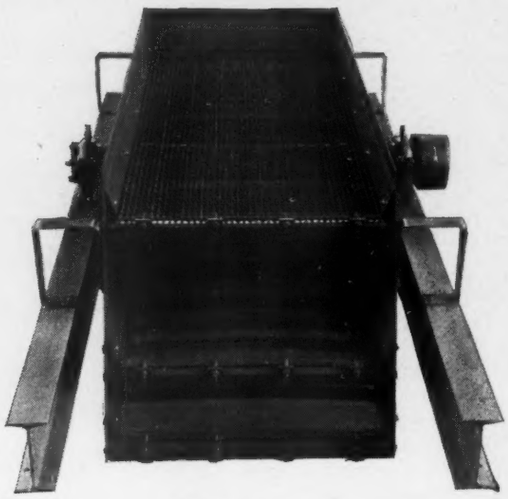
Simplicity Vibrators



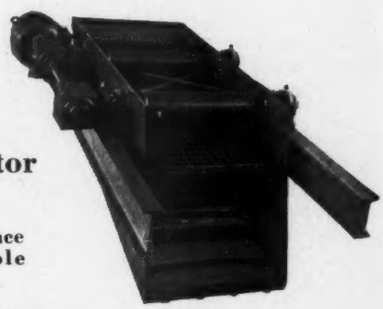
Simplicity "UTILITY" Single Vibrator
2'x6' Screen Surface—Single, Double and Triple Deck
3'x6' Screen Surface—Single, Double and Triple Deck

WHAT are the problems involved in your screening operations? Is your material wet, damp or dry? Is the flow of material such that the screens may be heavily loaded one minute and practically running idle the next?

Screens that are not adapted to meet the varying conditions of operation can eat up profits at an astonishing rate. See to it that ***your*** screens are built to cope efficiently with the conditions prevailing in your plant.

SIMPLICITY VIBRATORS are designed to take care of practically every screening operation with highest possible efficiency. There's a Simplicity —either the "UTILITY" or "SUPER"—exactly suited to meet your specific needs.

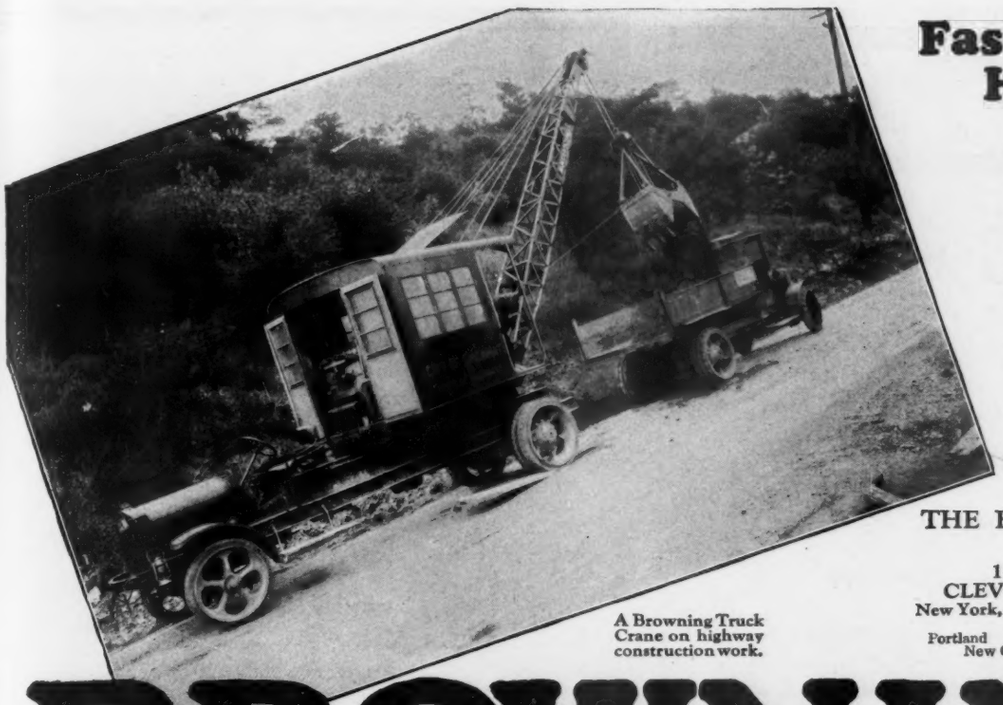
Simplicity "Super" Double Vibrator



3'x6' Screen Surface —Single, Double and Triple Deck.

Tell us about your screen requirements

SIMPLICITY ENGINEERING CO.
DURAND, MICHIGAN



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Faster—Easier Handling

BROWNING Gasoline Cranes —Truck or Crawler —are ideal handling units for construction work. Their ease of handling and their remarkable speed make possible faster work at a lower cost.

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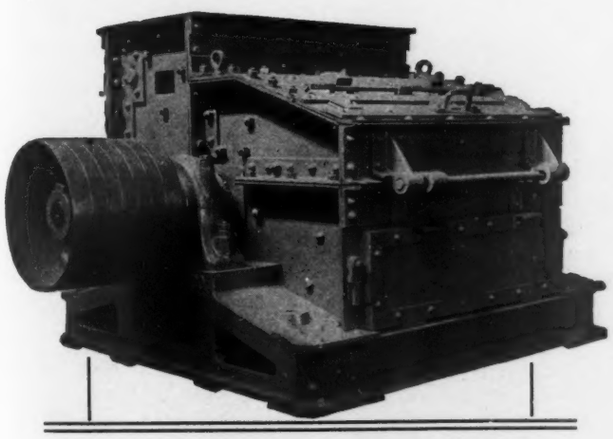
BROWNING

LOCOMOTIVE, TRUCK and CRAWLER CRANES—STEAM, GASOLINE, ELECTRIC

RUGGED and RELIABLE



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The following features of the

Bonnot Hammer Crusher

insure low crushing costs and uninterrupted operation over long periods.

Steel Plate Housing Strongly Reinforced
Manganese and Alloy Steel Grates and Hammers
Oversize Forged Steel Shafts

TIMKEN BEARING EQUIPPED

Heavy Duty Railroad Type Timken Roller Bearings
Bearings Sealed Against Dust
Ease of Access and Adjustment

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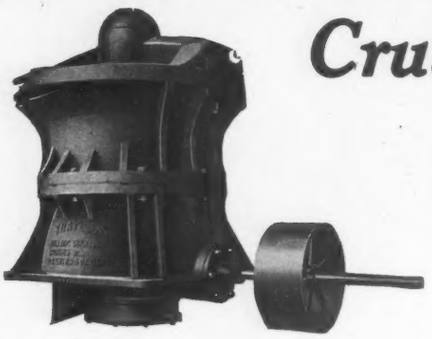
Chicago Office, 236 North Clark Street

TRAYLOR

Bulldog Gyratory Crusher



MANY operating difficulties encountered with gyratory crushers have been eliminated with the special advanced features found in the Traylor Bulldog.

The spider, for example, cannot weave—being so firmly seated in the top shell casting as to be practically an integral part of it, yet easily removable whenever required.

The shaft is indestructible. It is of extra large diameter compared to its length; auto-tightening suspension nut and head nuts prevent stripping; and the lower end is provided with a sleeve which takes care of all wear and constitutes a self-aligning feature.

These are some of the outstanding advantages that have won for the Traylor Bulldog wide favor among operators in all parts of the world.

Ask for Bulletin 1100

Bulldog Finishing Crusher

For crushing to finer sizes, the Bulldog Finishing Gyratory is the most dependable machine of its kind built. A unit of precision construction and absolute reliability.

Bulletin 1109 Covers

TRAYLOR ENGINEERING AND MFG. CO.
Allentown, Penna.

NEW YORK 30 Church St. | CHICAGO 1414 Fisher Bldg. | LOS ANGELES 605 Chester Williams Bldg.
SALT LAKE CITY 101 W. 2nd South St. | SEATTLE 815 Alaska Bldg.
Export, 104 Pearl St., New York City
Foreign Sales Agencies: London, Rangoon, Sydney, Melbourne, Johannesburg, Lima, Rio de Janeiro, Sao Paulo, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro—European Works: Usines Carels Freres, Ghent, Belgium

High and Dry

With a "Drag Shovel"

by PAGE

High and Dry above the water line, out of the mire, away from caving banks, accurate loading to hopper, cars, or trucks; the greatest digging efficiency ever known; the ability to dig deep (almost to the full reach of the boom). These features make the "Drag Shovel" absolutely essential to your gravel pit excavation.

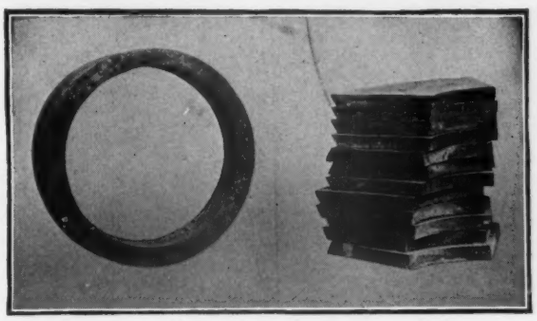
The Reach of a Dragline—the digging ability of a Shovel.

PAGE ENGINEERING CO.
844 Rush Street Chicago, Ill.

ADAMITE
(PATENTED)

Muller Tires and Pan Bottom Plates

ADAMITE, the wear resisting metal, is increasing production through fewer mill shutdowns for changes of worn-out tires and bottom plates. A corresponding increase in production is the natural result. In addition the extra life of Adamite means an actual saving in the annual expense of upkeep. A trial order will bring these facts directly home to you.



ADAMITE was developed for the express purpose of resisting wear.

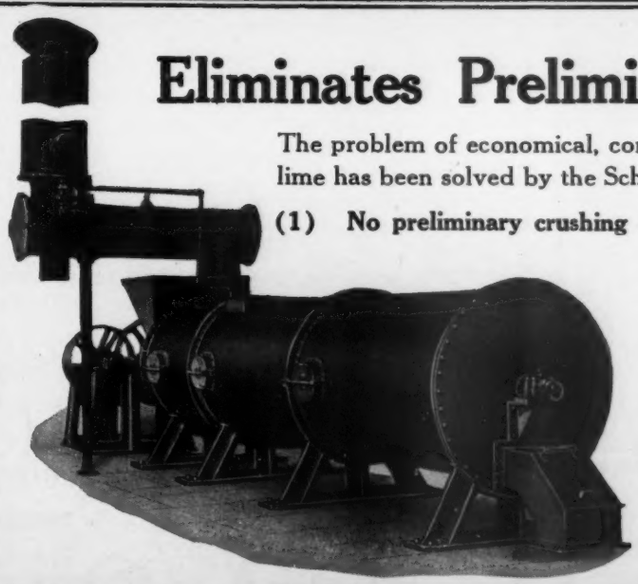
MACKINTOSH-HEMPHILL COMPANY
ESTABLISHED 1803 AT PITTSBURGH

Pittsburgh Iron & Steel Foundry
A. Garrison Foundry

PIONEERS
ENGINEERS
BUILDERS

Woodard Machine Company
Fort Pitt Foundry

SCHULTHESS HYDRATOR



Eliminates Preliminary Crushing

The problem of economical, continuous and perfect hydration of lime has been solved by the Schulthess Hydrator.

(1) No preliminary crushing of the lime.

(2) An absolutely dustless operation.

(3) A continuous, even flow of hydrate.

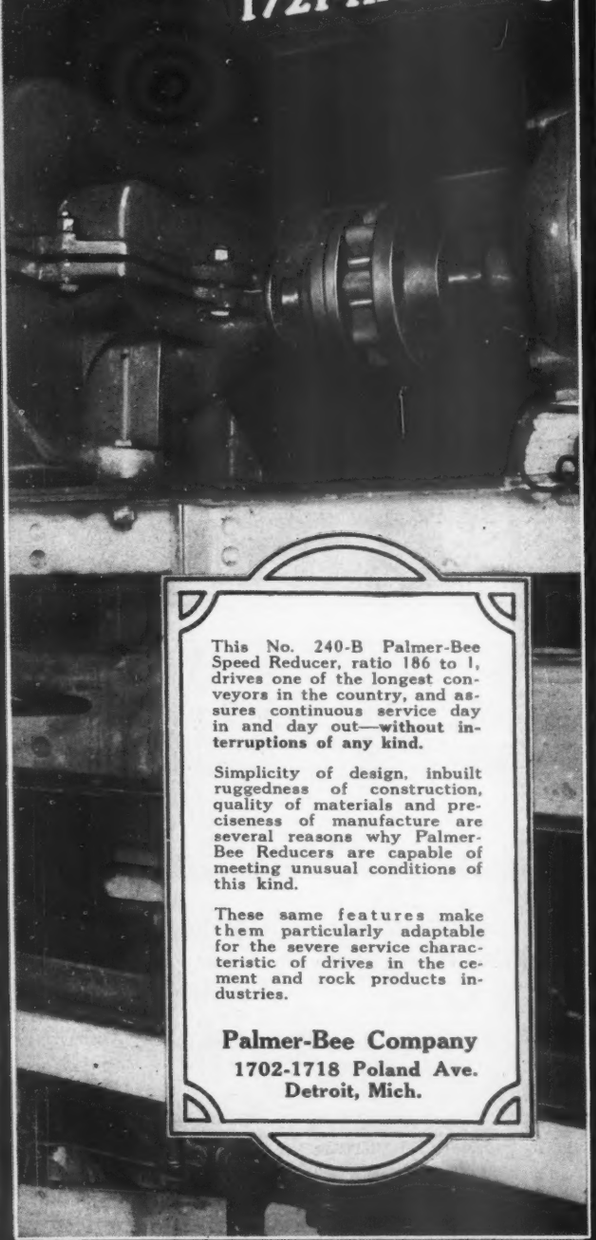
Twenty-six plants in operation.

Built in six sizes.

Write us for further information and prices

McGANN MANUFACTURING COMPANY, INC.
Engineers and Manufacturers
CHICAGO YORK, PA. NEW YORK

This P-B Speed Reducer Transmits the Power For a P-B Conveyor 1½ Miles Long



This No. 240-B Palmer-Bee Speed Reducer, ratio 186 to 1, drives one of the longest conveyors in the country, and assures continuous service day in and day out—**without interruptions of any kind.**

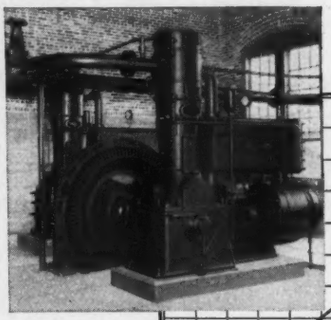
Simplicity of design, inbuilt ruggedness of construction, quality of materials and preciseness of manufacture are several reasons why Palmer-Bee Reducers are capable of meeting unusual conditions of this kind.

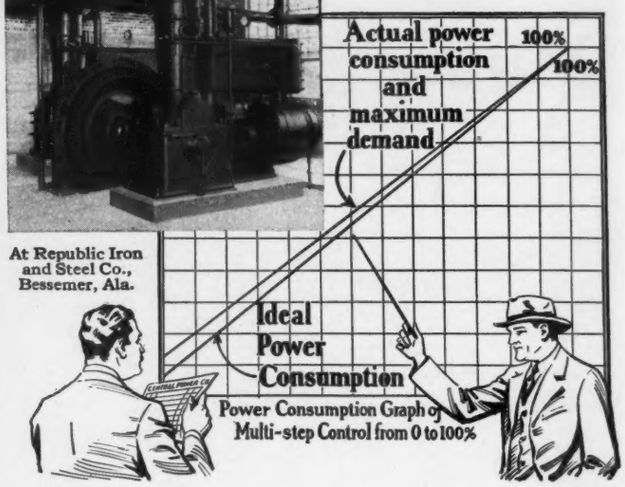
These same features make them particularly adaptable for the severe service characteristic of drives in the cement and rock products industries.

Palmer-Bee Company
1702-1718 Poland Ave.
Detroit, Mich.

Palmer-Bee
Spur and Herringbone
Speed Reducers

"There's More Than One Reason—




Actual power consumption and maximum demand
100%
100%
Ideal Power Consumption
Power Consumption Graph of Multi-step Control from 0 to 100%

At Republic Iron and Steel Co., Bessemer, Ala.

Why Angle Compounds Save Power"

"Say Riley, got a surprise for you. Power bills been running below estimates, and we couldn't figure out why. But last week, we hooked a meter onto that new Air Compressor you recommended, and . . ."

"That would have surprised me too, Mr. Brown, only I've checked up on Angle Compounds before. There's more than one reason why they save power; but the main one is *multi-step load control.*

"Just look at this chart. Right now we're using 60% of our Angle Compound's capacity and power consumption is only 4% more than ideal. If we drop way down to 30% of the capacity, power consumption is 7% greater. While, if we use 80% of the compressor's capacity, power cost is only 2% over ideal.

"Here's the idea, Mr. Brown—at any partial load, Angle Compounds use less power per unit of air compressed, than any other compressor."

"It must be so, Riley. The meter proves it. But I'm curious to know just how Angle Compounds do it."

Multi-step control is only one of many Angle Compound advantages a Sullivan Engineer will gladly explain. *Shall we send you Catalogue* 83-A?

Are You Following Riley and Brown?

Superintendent Riley recommended the purchase of an Angle Compound Compressor, General Manager Brown agreed, and the machine was installed. Now Brown finds power costs running below estimates.

BALANCED SULLIVAN ANGLE COMPOUND

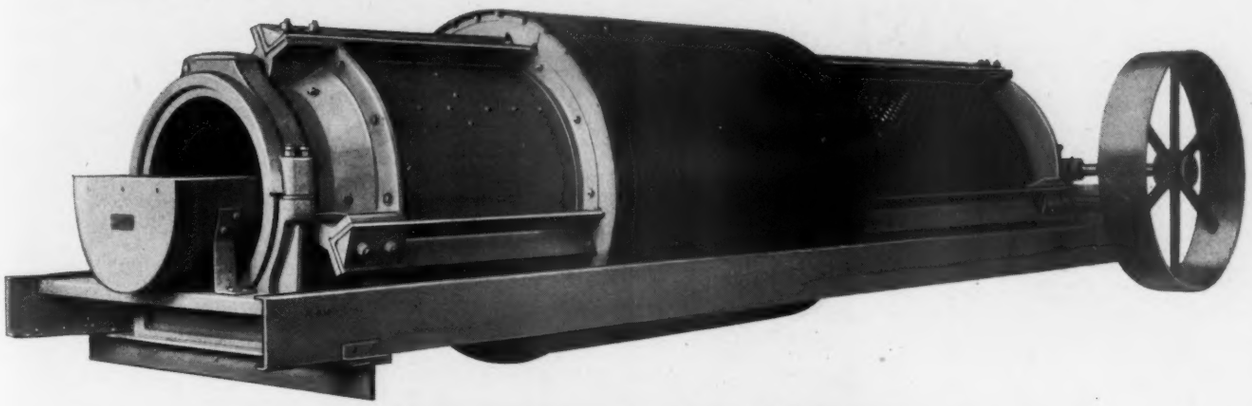
For lowest possible cost per unit of air compressed

Sullivan Machinery Company
82 E. Adams St.
CHICAGO

SULLIVAN TRADE MARK

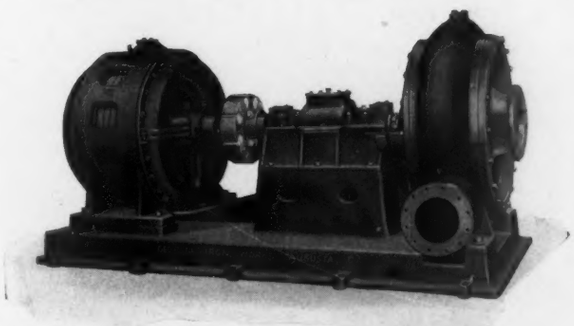
ROLLERLESS ROTARY SCREEN

The unique and exclusive Rollerless feature of this Rotary Screen, assuring perfect alignment at all times, permits of equipping the Rollerless Rotary Screen for any service required, regardless of the duty that it may be required to perform. Whether it be a plain Screen or with one or more outer jackets, or with a scrubber compartment for washing purposes, the Rollerless Rotary is the logical Screen to use.



GALLAND-HENNING
MANUFACTURING COMPANY
MILWAUKEE — U. S. A.

HEAVY DUTY SAND PUMPS



10-in. Left Hand Bottom Discharge Heavy Duty Sand Pump directly connected to 300 H.P., 600 R.P.M. Allis-Chalmers Type ANY Motor

THE accompanying cut shows one of our Heavy Duty units. These pumps are very rugged and are substantially built throughout. The bearings, both radial and thrust, are of such design and construction that the unit is capable of meeting extreme conditions of severe service.

Our line now embraces these pumps in sizes 6-in., 8-in., 10-in., 12-in., 14-in., and 15-in., can be supplied for directly connected motor drive, or for chain or belt drive. All units can be furnished in either right or left hand, and position of discharge top or bottom.

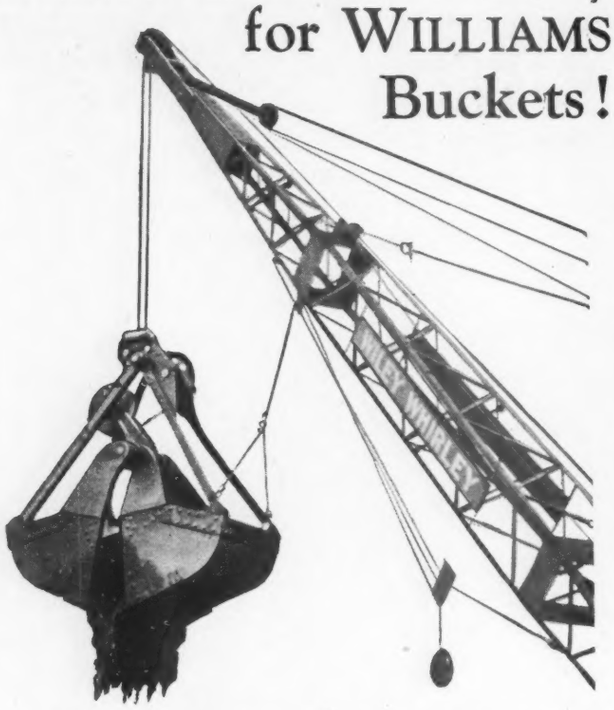
Prices and descriptive sheets sent on request

GEORGIA IRON WORKS

AUGUSTA, GEORGIA

Established 1891

Score another victory for WILLIAMS Buckets!



West Penn Sand & Gravel Co., of Rochester, Penna., obtained such satisfactory results from their WILLIAMS Scraper Type Buckets, that they refused to experiment with any competitive bucket when they needed a new one

Every time you watch a WILLIAMS Bucket dig in, get a full load, and snap open for a fast dump—

You can see why the WILLIAMS Bucket is its own "star salesman," and why so many WILLIAMS users stick to WILLIAMS.

They have learned from experience that it pays to use the bucket that is all bucket—that has the weight built in instead of hung on as counterweights. Extra stamina in every part, and it's all steel, including the sheaves.

WILLIAMS "Double-Arch" Dragline—you'll never see the sides of this bucket drawing in.

Write for our new Bucket Book showing what WILLIAMS Buckets are doing on all kinds of work.

G. H. WILLIAMS COMPANY
614 Haybarger Lane, Erie, Pa.
Branch Offices: New York Pittsburgh Cleveland Chicago

WILLIAMS
FAST-DIGGING BUCKETS

Superior Performance ..a Built-in Quality of the UNIVERSAL

ANY screening device, to be entirely satisfactory, must be able to handle a large quantity of any kind of material without clogging, produce a clean separation at the mesh used, and be so constructed as to have the longest life under severe operating conditions.

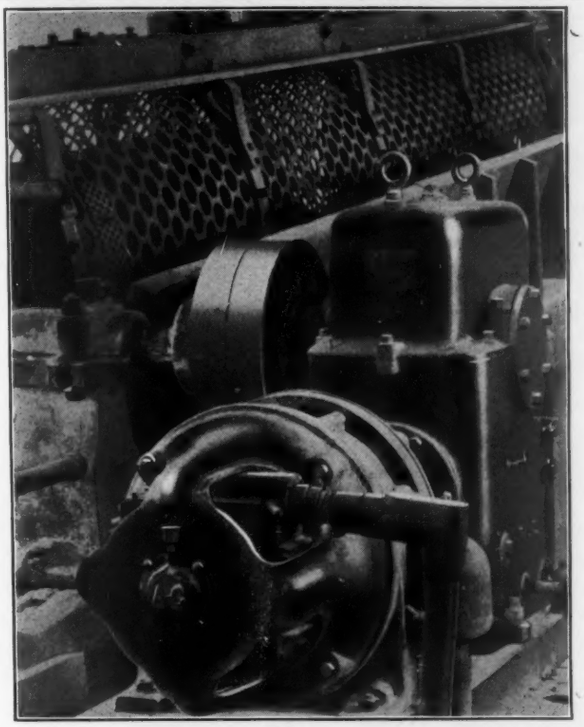
The ability of Universal Vibrators to measure up to these fundamental requirements is well known. Hundreds of operators, with varying screening problems, have chosen Universal as the logical machine.

The superior performance that has characterized Universal installations has been achieved because of the fundamentally correct design and careful construction of these screen units. Whatever your particular problem, we are sure the Improved Type "C" will give a new conception of what to expect in the matter of screen efficiency.

Highest in Efficiency
Lowest in Cost

UNIVERSAL VIBRATING SCREEN CO.
RACINE - - WISCONSIN

Large production on standard size units permits a lower price on Universal Vibrators. Write for Catalog No. 70.



Cleveland WORM GEAR REDUCTION UNITS

For Driving

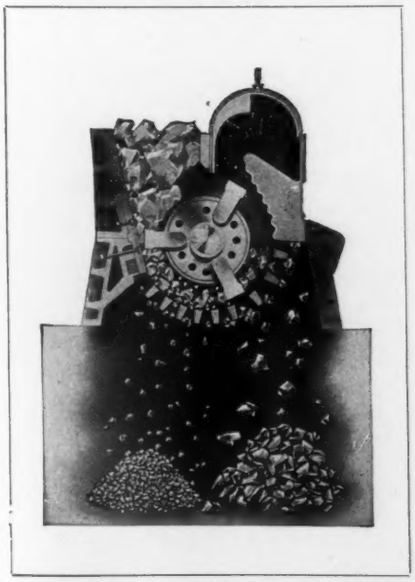
CONVEYORS
ELEVATORS
SCREENS
AGITATORS
DRYERS
FEEDERS

Bulletin 106 describes the standard line of Cleveland Worm Gear Drives. A copy will be sent promptly on request.

CLEVELAND WORM & GEAR COMPANY

3272 EAST 80th STREET CLEVELAND, OHIO

Gruendler Heavy Duty Crusher for Mine, Pit and Quarry



Cross section illustrating the New Gruendler All-Steel, Roller Bearing Swing Hammer Crusher, showing the arrangement of grate bars giving the different size material.

Big Production— Low Operating Cost

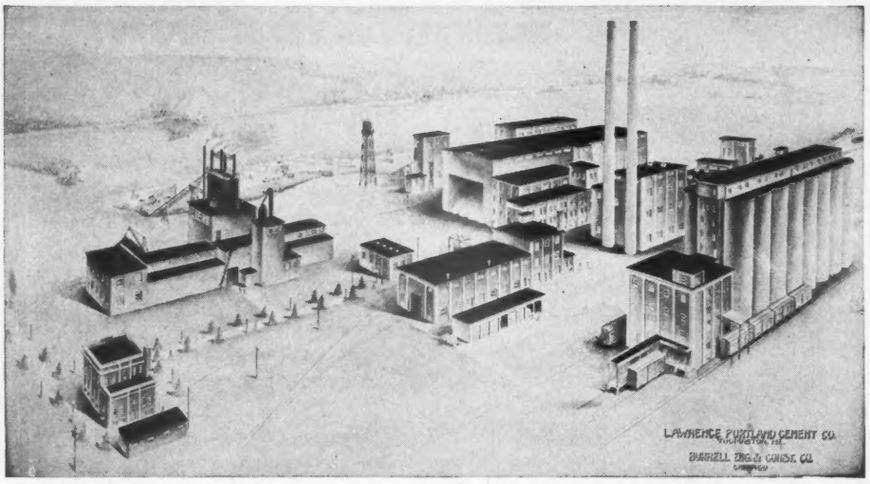
This Crusher will produce a large capacity of limestone, etc., at the minimum cost of operation. Material ¾" and finer for concrete work for which there is a great demand, can be handled on this Crusher without a preliminary crusher at a saving of 25% to 40% in operating cost. The same machine is adapted for pulverizing limestone to agricultural dust for which the demand is greater today than the output.

Gruendler Patent Crusher and Pulverizer Co.

ST. LOUIS, MISSOURI

BURRELL ENGINEERING and CONSTRUCTION COMPANY

513 JACKSON BLVD., CHICAGO



Designers and Builders of

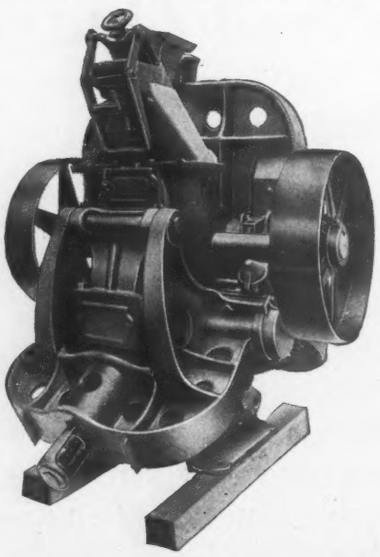
Cement Plants, Stone Crushing Plants, Lime and Gypsum Plants, and Associated Buildings

Our artist's conception of the plant under construction for Lawrence Portland Cement Company, Thomaston, Maine, noteworthy because plant is practically concrete throughout

A PARTIAL LIST OF OUR CLIENTS

Albert Mfg. Co.
Atlantic Gypsum Co.
Blue Mountain Stone Co.
Colorado Portland Cement Co.
Coplay Cement Mfg. Co.
Great Lakes Portland Cement Co.
Hoosac Valley Lime Co.
Huron Portland Cement Co.
Indiana Portland Cement Co.
International Cement Co.
Lawrence Portland Cement Co.
Lehigh Portland Cement Co.
Louisville Portland Cement Co.
Louisiana Portland Cement Co.
Michigan Alkali Co.
Nazareth Cement Co.
New York Trap Rock Co.
Newaygo Portland Cement Co.
Petoskey Portland Cement Co.
Sandusky Cement Co.
Southern Cement Co.
Tomkins Cove Stone Co.
United States Portland Cement Co.
United States Gypsum Co.
Utica Hydraulic Cement Co.
Volunteer Portland Cement Co.
Wellston Iron Furnace Co.

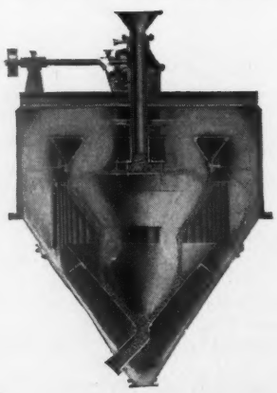
Maxecon Mill



for economical pulverizing

American Filter Air Separator

for fine separating



Perfectecon Screen

for coarse screening

KENT MILL COMPANY

10 Rapelyea Street Brooklyn, N. Y.

In Another Prominent Cement Plant

7 out of 9 ARCOFRAX *Hot Zone Linings*

Have Already Given 22 Months' Actual Service

THREE to five months was the average life of high grade fire clay brick in the hot zones of a well-known cement company.

In May, 1926, the hot zones of three 10-foot kilns and six 8-foot kilns were lined with ARCOFRAX High Alumina Brick.

One of these linings gave 12 months' actual service. Another gave 16 months' actual service.

Seven of the linings are still in service at last report —more than 22 months' operation—and are apparently good for some time to come.

If you are not using ARCOFRAX High Alumina Brick in your hot zones, why not try a lining? Let us quote you, or tell you more about ARCOFRAX performance in wet and dry process plants.

GENERAL REFRACTORIES COMPANY

106 South 16th Street, Philadelphia, Pa.

District Offices: Buffalo Chicago Cleveland Detroit Indianapolis New York Pittsburgh

Canadian Representative—Webster & Sons, Ltd., Montreal, Canada

Works—Baltimore, Md. Beech Creek, Pa. Claysburg, Pa. Danville, Ill. Hitchins, Ky. Joliet, Ill. Karthaus, Pa. Mill Hall, Pa. Mount Union, Pa. Olive Hill, Ky. Orviston, Pa. Rockdale, Ill. Sandy Ridge, Pa. Sproul, Pa. West Decatur, Pa.

Move More Stone With Quick-Spotting Shays

MINUTES saved in quick starting of cars on signal and speedy, accurate spotting for loading, loom large at the end of the day when quarry output is summed up.

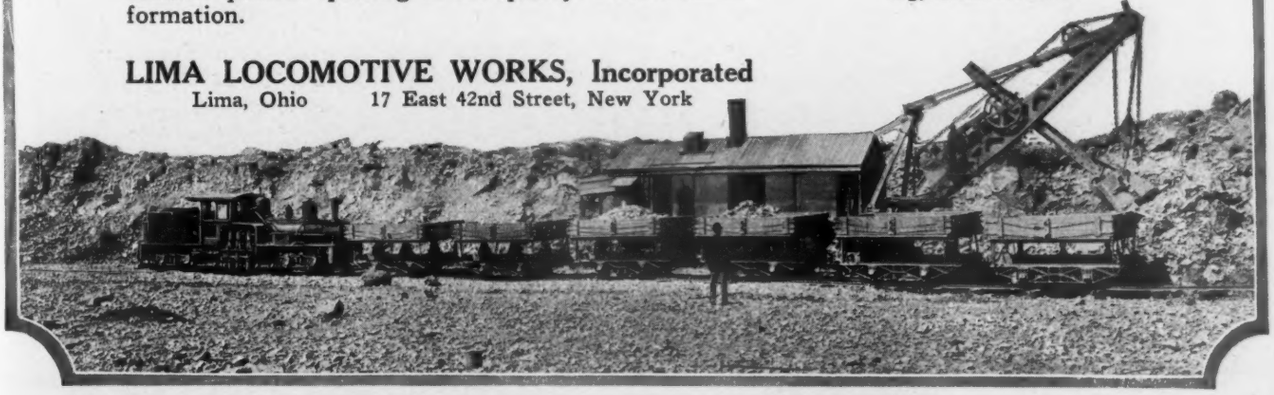
In spotting, Shays are 11% faster than rod locomotives, as tests have frequently proved.

Faster-working Shays, quick in accelerating and spotting, speed stone movement, conserve time and improve quarry production.

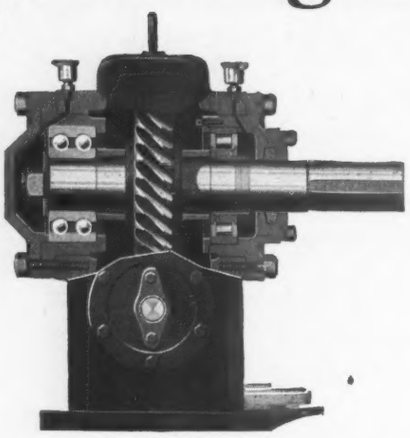
We shall be glad to explain how Shay construction assures quicker spotting in the quarry. Write for information.

If you haven't a copy of the latest Shay catalog, write for one

LIMA LOCOMOTIVE WORKS, Incorporated
Lima, Ohio 17 East 42nd Street, New York



Meeting all Requirements--



Philadelphia
SPEED REDUCING UNITS

EXPERIENCE has proved that no "single type" of speed reducer will successfully fulfill all drive requirements. Different types of driven equipment and varying operating conditions require gear units specially adapted to best handle the given job.

Philadelphia Speed Reducers are built with this knowledge in mind. Hence, we build a complete line of gear driven units, consisting of Spur Gear—Worm Gear—Herringbone Gear—Spiral Bevel Gear—Spur Bevel Gear—and Combination Spiral Bevel and Herringbone Gear. In the Philadelphia line you'll find the ideal unit for every given purpose.

Above—Type A-X Worm Gear Unit, designed especially for overhung load conditions on gear shaft, without use of outboard bearing. Worm Gear is of chill cast Bronze.

Worm and shaft are integral with hardened and ground threads. Double row Ball Bearing is used to take both worm and gear thrust, with Heavy Duty Roller Bearing taking overhung load.

Let us figure with you on your power transmission problems

PHILLIE GEAR

Main Office and Plant Erie Ave. and G St. Phila., Pa.

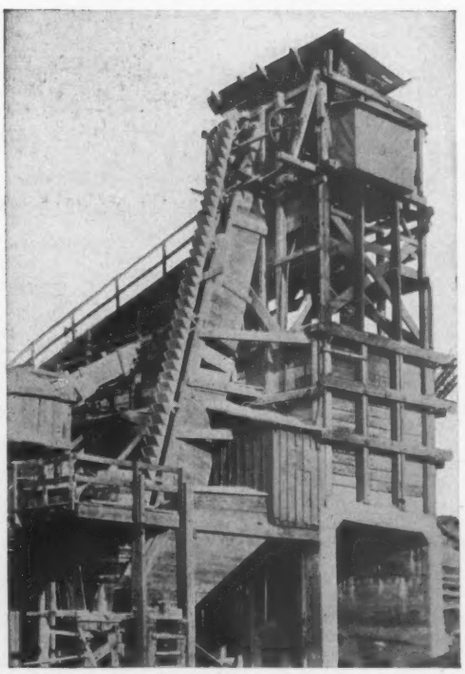
PHILADELPHIA GEAR WORKS

Manufacturers of Industrial Gears and Speed Reducing Units

PHILADELPHIA, PENNA.

Branch Sales and Engineering Office: 12 E. 41st St., New York

SAND and GRAVEL PLANTS



Webster plants for the washing of sand and gravel are designed along simple and substantial lines, avoiding the introduction of any of the impractical elaborations of conveying and handling equipment which experience has proved unreliable and undesirable. Every plant is designed especially to meet the requirements of the material it is to handle and the conditions under which it is to operate.

Webster Engineers Are at Your Service
We Make a Complete Line of

MATERIAL HANDLING EQUIPMENT
for Sand, Gravel, Cement, Stone, Gypsum, Etc.

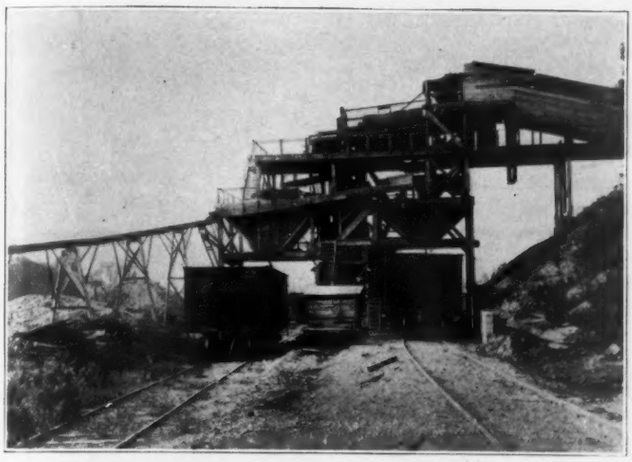
THE WEBSTER MFG. COMPANY
1856 N. Kostner Ave., CHICAGO

WEBSTER —Write to—

IF YOU CONTEMPLATE

Building a New Sand and Gravel Plant or Rebuilding The Old One

Why not benefit by our practical experience?



A little plant with a big capacity. The Crescent Gravel Company, Hersey, Michigan. Built in 1927. Capacity 30 cars per day.

Our designs are the results of actual plant operations, obtained under all conditions.

We have helped solve the problems of the above concerns—may we help you?

The F. M. Welch Engineering Service

Consulting Engineers **Greenville, Ohio**

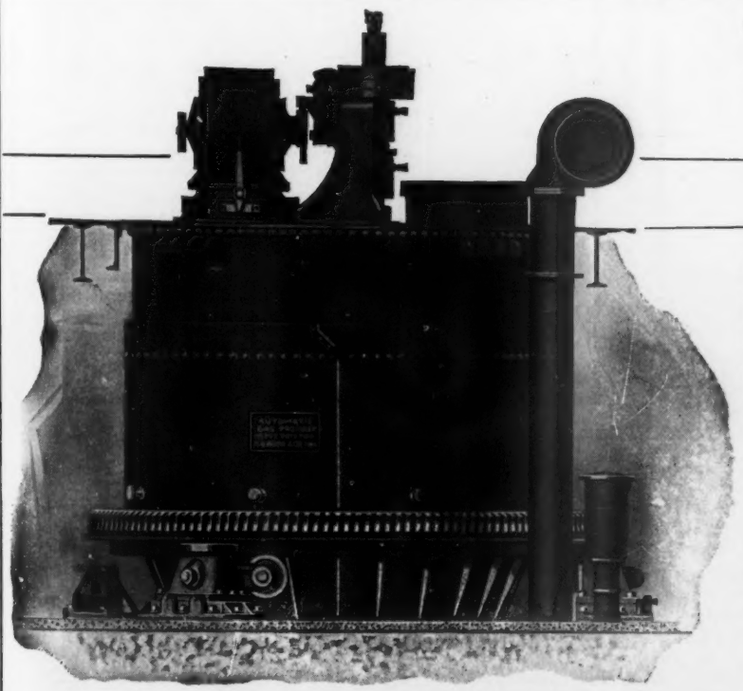
Chief Engineer of

The Greenville Gravel Corporation, Greenville, Ohio.

Consulting Engineers for

Allegany Sand and Gravel Co., Olean, N. Y.
Atlas S. & G. Company, Hartford, Conn.
Benzieco Gravel Company, Beulah, Mich.
Boston S. & G. Company, Boston, Mass.
Crawford Sand and Gravel Co., Jamestown, Pa.
Crescent Gravel Company, Hersey, Mich.
Dayton Gravel and Sand Co., Dayton, Ohio.
Fountain Sand and Gravel Co., Pueblo, Colo.
Granite S. & G. Company, Indianapolis, Ind.
Hagersville Quarries, Ltd., St. Thomas, Ont.
Hersey Gravel Company, Hersey, Mich.
Industrial Sand and Gravel Co., Lawton, Okla.
Interstate S. & G. Company, Covington, Ind.
J. N. Dugan S. & G. Co., Cincinnati, Ohio.
Jno. E. Russell Co., Ltd., Toronto, Ont.
Johnson-Hudson Gravel Co., Chillicothe, Mo.
Keystone Gravel Company, Dayton, Ohio.
Lehigh Sand and Stone Co., Scranton, Pa.
Limestone Lumber Co., Maysville, Ky.
Mercer Sand Company, Meadville, Pa.
Meriwether S. & G. Company, Shreveport, La.
Merom Gravel Company, Merom, Ind.
Midland Gravel Company, Millbrook, Mich.
Ray Sand and Gravel Company, Oxford, Mich.
Roquemore Gravel Co., Montgomery, Ala.
T. J. Hall and Company, Cincinnati, Ohio.
Wilson Sand and Supply Co., Huntington, W. Va.
Wolf Creek Gravel Company, Dayton, Ohio.

And Others



THE NEW WOOD GAS PRODUCER

Used in Leading Lime Plants

The new Wood Heavy Duty Producer is the result of twelve years' experience in the design, manufacture and operation of Automatic Gas Producers. Every detail of the machine is built for

Heavy Duty and Continuous Service

and for this reason the cost of upkeep is considerably less than with any other Mechanical Gas Producer.

Our Catalog Will Interest You. Write For It.

HYDRAULIC MACHINERY AND OPERATING VALVES

R. D. WOOD & CO.

ESTABLISHED 1803

PHILADELPHIA, PA.

CAST IRON PIPE, HYDRANTS AND VALVES

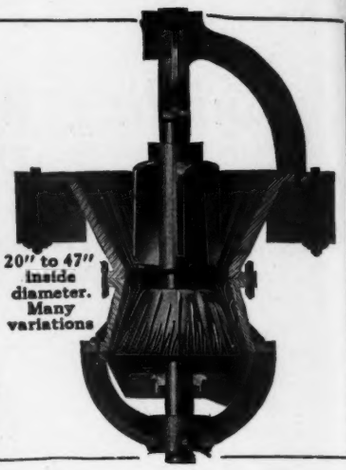
Nippers—17x19", 18x26", 20x30", 24x36" and 26x42"

JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

Special Crusher-Grinders for Lime



20" to 47" inside diameter. Many variations

Butterworth & Lowe

17 Huron St. Grand Rapids, Mich.

TROCO for Crushers

WHEN your crushers are correctly lubricated they will:

—wear longer;

—require minimum power;

—need minimum repairs;

—operate with fewer interruptions.

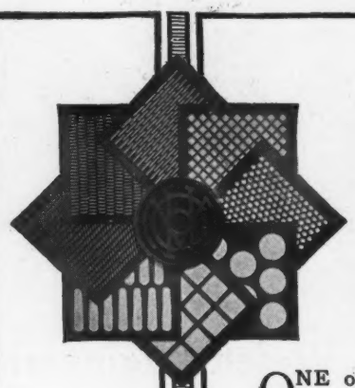
These are the results to be obtained with TROCO—the specialized crusher lubricant.

Ask about our liberal 60-day FREE TRIAL OFFER.

TROCO LUBRICATING COMPANY

Formerly Tredick Oil & Grease Co.

2642-48 N. Mascher St. Philadelphia, Penn.



Makers of Mitco Interlocked Steel Grating, Mitco Shur-Site Stair Treads and Mitco Armorgrids

A Wide Choice of Screen Openings

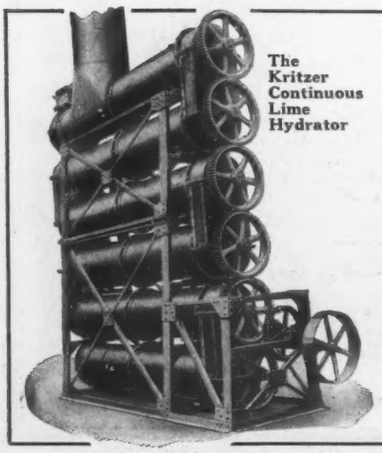
ONE of the big advantages of using plate for screens is that openings can be made just about any style desired.

Openings may be square, round or slotted.

That's why so many pit and quarry operators come to Hendrick for their screening equipment. They know that no matter what their requirements are their orders can be promptly filled.

HENDRICK MFG. CO.

47 Dundaff St., Carbondale, Pa.
New York Office: 30 Church St.
Pittsburgh Office:
904 Union Trust Bldg.
Hazleton, Pa., Office:
738 West Diamond Ave.



The Kritzer Continuous Lime Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY

515 West 35th Street CHICAGO, ILL.

From Maine to California, from Canada to the Argentine, in Japan, England and Continental Europe

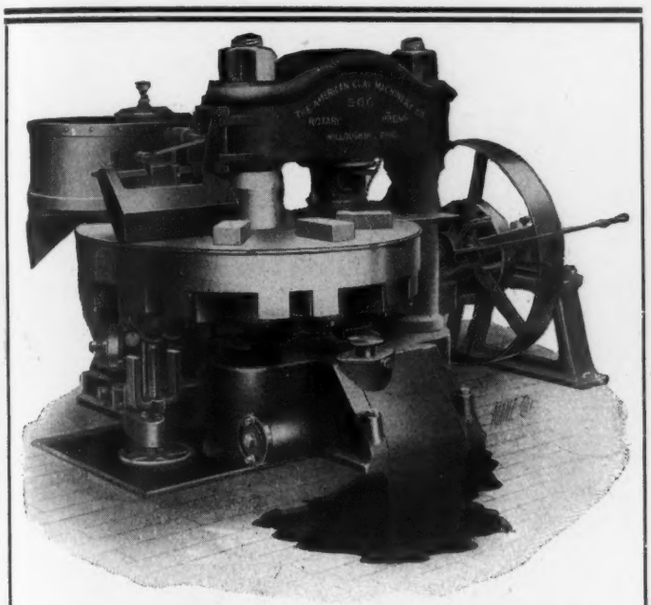
GAYCO DRY CENTRIFUGAL SEPARATORS

are giving wonderfully satisfactory results

Repeat orders tell the story — numerous customers use from two to twenty GAYCO SEPARATORS sizing dry ground materials.

Any fineness from 80 mesh to 325 mesh. Six sizes—30 inches to 14 feet in diameter.

Rubert M. Gay Company, Inc. **114 Liberty St.** **New York, N. Y.**



A MODEST machinery investment, a few men, and you are equipped to manufacture Sand-Lime Brick on a profit-paying basis. The brick you make today are ready for use tomorrow. That's quick turnover—and PROFIT!

Write us for details

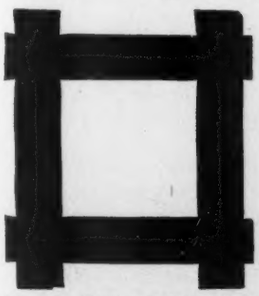
W. A. RIDDELL COMPANY
Bucyrus, Ohio
Formerly Hadfield-Penfield Steel Co.

PRIMM OIL ENGINES

A prime mover that has SAVED THOUSANDS OF DOLLARS in most of the leading industries, the Primm Oil Engine demands the consideration of all buyers of power equipment. ECONOMICAL — STEADY — DEPENDABLE — EASY TO OPERATE—an ideal power unit for the quarrying industry.

the POWER MANUFACTURING CO.
705 Cheney Avenue
MARION, OHIO
"Oil Engine Builders for a Quarter Century"

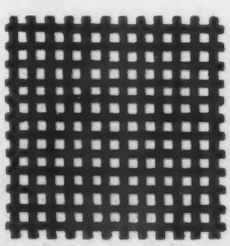
"CLEVELAND" DOUBLE CRIMPED WIRE CLOTH



1" mesh (¾" opening) ¼" wire

A uniform fineness is assured by the use of "Cleveland" Double Crimped Wire Cloth, making it unequalled for the screening of Sand, Gravel, Crushed Stone and Cement. "Service" is the definite policy of this organization, and through every phase of manufacture this end is constantly before us.

A large stock always on hand. However, any special mesh will be manufactured to suit requirements. PRICES RIGHT.



THE CLEVELAND WIRE CLOTH AND MANUFACTURING COMPANY
3573 East 78th Street **Cleveland, Ohio**

Slackline

CABLE DRAG SCRAPERS

for handling sand, gravel, stone and other bulk materials. Lowest first cost. Ideal for stock piling.

SLACKLINE EXCAVATORS

for excavating sand and gravel in dry or wet pits over long hauls.

It Digs—It Elevates—It Conveys
One Man and One Machine Does It All

Write for Catalog

Scraper

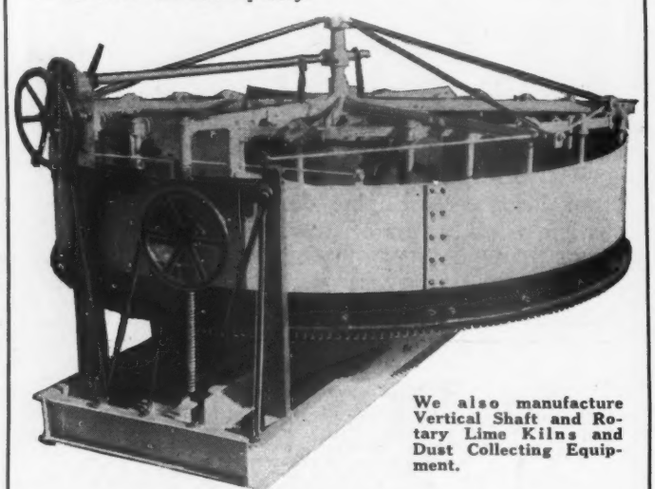
313 Arch Street
Philadelphia, Pa.

R·H· BEAUMONT CO

1544C Straus Bldg.
Chicago, Ill.

Confidence

IT was not bought—it cannot be sold—this confidence the hydrate industries place in the "Clyde" Hydrator. Only by a consistent policy of honest engineering and manufacturing effort was this confidence won. Our most valuable asset—our single aim is to keep it by continuing to exercise the same policy.



We also manufacture Vertical Shaft and Rotary Lime Kilns and Dust Collecting Equipment.

H. MISCAMPBELL

Patentee and Sole Manufacturer

DULUTH Patented Aug. 14, 1923 Serial No. 1464722 MINNESOTA

New Type Dust Arrestor

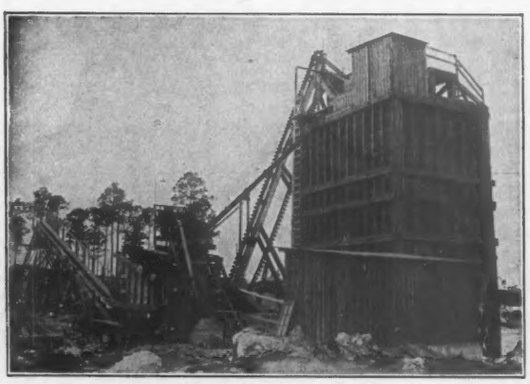
Each bag has individual spring suspension. Shaking is done horizontally, like snapping a rug, flexing material and getting all dust out of cloth.
In ten minutes a bag can be replaced and operation resumed.

Patented and Patents Applied for

"Quality Equipment Pays in the End"

THE NEW HAVEN SAND BLAST CO.

New Haven, Conn. Cleveland, Ohio



AFTER THE FIRST YEAR

Comes the Real Test of Crusher Value

RELIANCE EQUIPMENT

is built of the best materials obtainable for the purpose and guaranteed to stand up under the most severe operating conditions with minimum cost for maintenance.

We Offer Complete CRUSHING, SCREENING and WASHING PLANTS in Any Capacity, from 50 to 1500 Tons per Day

Write for Catalogue and Prices

Universal Road Machinery Co.

Kingston, N. Y.

"RELIANCE"—The Crusher with the Longer Life

DIXON'S WATERPROOF GREASE

Dixon's Waterproof Graphite Grease

The graphite is the vital element, for it relieves the grease of a very considerable portion of its task of keeping metallic bearing surfaces apart.

Dixon's Waterproof Graphite Grease is of dense consistency, suitable for general heavy service with slow speeds and heavy pressures.

It possesses a remarkable adhesiveness and cannot be washed off, even by running water, sea water, or alkaline and sulphuric mine water. It cannot gum or become rancid. As a rust preventive it is unsurpassed.

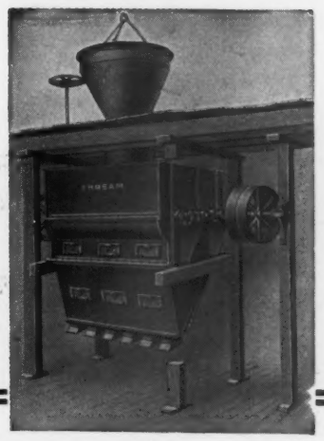
Write for Circular 17-W.

JOSEPH DIXON CRUCIBLE COMPANY

Jersey City New Jersey

Ehrsam Mixers

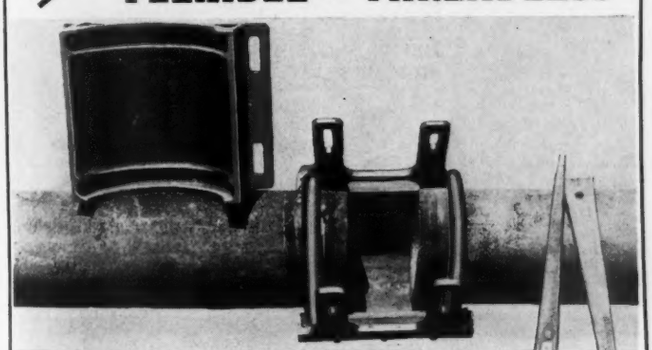
The careful buyer of machinery will always consider the record of the manufacturer. We are pioneers in the building of plaster mixers. Ehrsam Mixers have led the field for years—because they are machines that have never failed to ***make good.*** On their record they have won the whole-hearted endorsement of the gypsum industry.



The J. B. Ehrsam & Sons Mfg. Company
Enterprise, Kansas

FONS

FLEXIBLE ~ THREADLESS



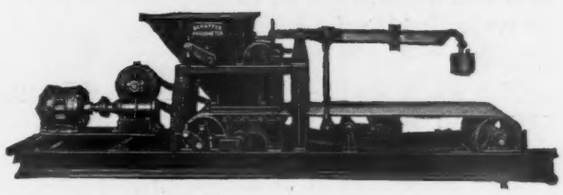
Metal Pipe Couplings

The **Quickest, Simplest and Cheapest** way of connecting pipe lines on all kinds of hydraulic operations in pit, mine and quarry. Flexible to 40 degrees—never wear out—and cheaper than rubber sleeves. No threads to cut. Use any old pipe.

Fons Flexible Metal Pipe Couplings will SAVE YOU MONEY! Write for descriptive bulletin.

FONS FLEXIBLE PIPE COUPLING CO.
ROYAL OAK, MICHIGAN

SCHAFFER POIDOMETER



ALMOST HUMAN

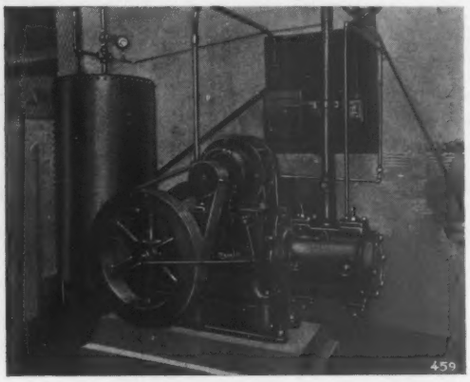
Schaffer Poidometers are the mechanical brains of the plant. They are more than that—they are guardians of the quality standards you have set for your product—they prevent waste and assure accuracy and maximum economy.

If you are handling a variety of materials, arrange your Poidometers in batteries—set one for each material and for the proportion wanted—then forget it! The Poidometer will do your bidding better than your most loyal employee. If any machine is not getting its full quota of material, the entire battery will automatically stop. Space does not permit of a thorough explanation of the many cost-saving qualities of Schaffer Poidometers.

WRITE FOR FULL DETAILS

SCHAFFER POIDOMETER CO.
2828 Smallman, Pittsburgh, Pa.

"None Better Built"

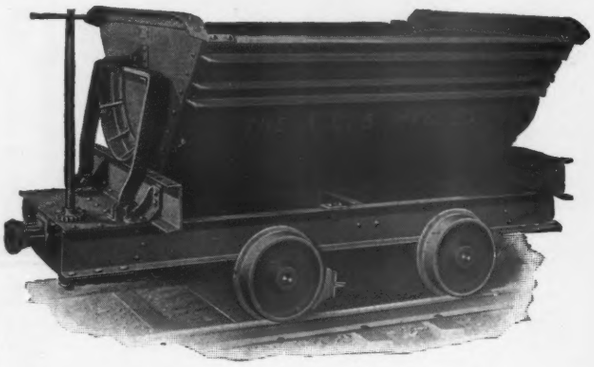


Multiple Belt Driven Single Stage Air Compressor

Multiple Belt Driven Air Compressors Offer Many Advantages

Among them are inexpensive maintenance, shorter foundations, higher efficiency through elimination of belt slippage, and quietness of operation. Full details will be sent on request.

PENNSYLVANIA Pump & Compressor Co.
EASTON, PA.



More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.

BEMIS
WATERPROOF
BAGS
Easy to Fill
A simple wire tie closes the Bemis *Waterproof* Bag for crushed quicklime—a quicker, easier, less expensive job than heading a barrel. Many other economies. Write for details.
BEMIS BRO. BAG CO.
410 Poplar St., St. Louis, Mo.
LR187
YOUR NAME
YOUR QUICK LIME BRAND
AND ADDRESS
SINCE 1858 THE WORLD'S LARGEST MAKERS OF QUALITY BAGS

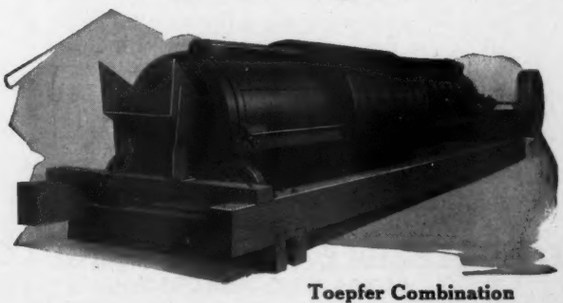
These Factors Determine Selling Prices

QUALITY—PRODUCTION COST—these are the factors that determine what you will get for your gravel. On the first depends how much the buyer will pay. On the second depends the amount you must ask in order to show a profit.

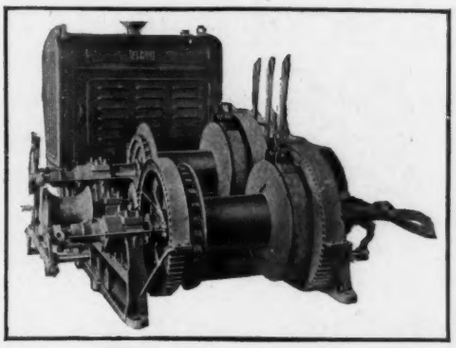
The Toepfer Screen works both ways. It insures a clean, high quality product—and is notably a low cost producer.

Write us for details

W. TOEPFER & SONS COMPANY
Milwaukee Wisconsin



Toepfer Combination Scrubber Screen



HOIST YOUR PROFITS WITH FLORY'S TWO-SPEED HOIST

Flory's Two-Speed Hoist has an instantaneous change of speeds with load on drum, without stopping motor or hoist. It is especially adapted to Slack Line Excavation and Quarry Operations. It means quicker hoisting—more work per day—more profit on every job.

Write for Bulletin

S. FLORY MFG. CO.
BANGOR, PA.

Flory also builds Steam and Electric Hoists, Cableways, Carpullers, Dredging Machinery, etc.

Sales Agents in Principal Cities

THE SAGINAW ROTARY PRESS

Equipped with a Saginaw Rotary Press in 1904—this same press is today making over 3000 brick per hour.

JACKSON & CHURCH
SAND LIME BRICK MACHINERY **company** SAGINAW, MICH. U. S. A.

ENGINEERS

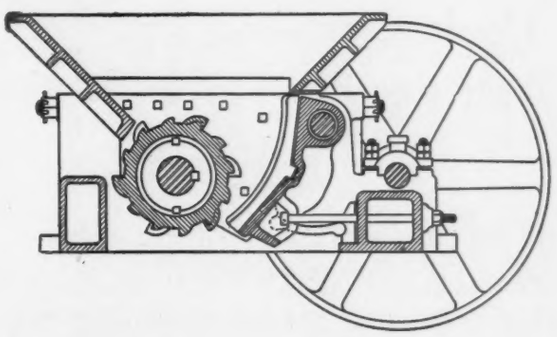
You can save money by using standardized methods

FERGUSON can show you how you can save time and money by using standardized methods in construction and equipment. It is possible that this organization, familiar as it is with problems of the cement industry, can make recommendations that will result in important economies for you.

Write, wire or phone for a Ferguson executive.

THE H. K. FERGUSON COMPANY
Hanna Building · · · Cleveland, Ohio
Phone: SUperior 3620
New York · Detroit · Birmingham · Tokio, Japan

Ferguson
ENGINEERS



IF you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material

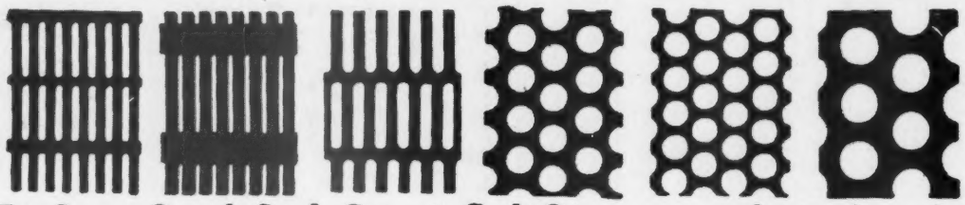
Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.
Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.

PERFORATED METAL SCREENS

All sizes and shapes of Holes



Everything in Perforated Metal

For Stone, Gravel, Sand, Cement, Coal, Ore or any product to be screened

The Harrington & King Perforating Company

5650 Fillmore St., Chicago, Ill., U. S. A. **New York Office: 114 Liberty Street**

LOCOMOTIVE OHIO CRANE

Steam—Gas—Electric

Hook, Clamshell, Dragline

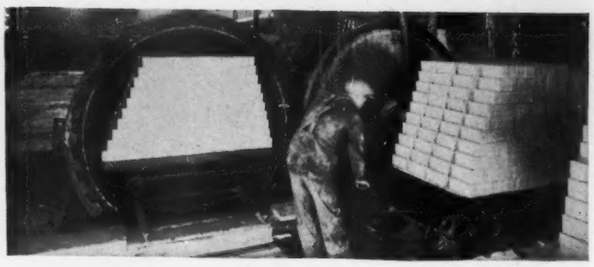
Magnet or Pile Driver Service

10 to 50 Ton Capacities

The Crane with the 10 Year Guarantee
Catalog on Request

THE OHIO LOCOMOTIVE CRANE CO.
High Street, Bucyrus, Ohio

Boost Profits!



Taking the finished brick from the hardening cylinder

THE Komnick Process and Sand-Lime Brick Machinery provides the ideal means for profitable expansion of any number of plants now producing sand or lime. The equipment investment for a profit paying Sand-Lime Brick plant is comparatively small—yet the profit possibilities are practically unlimited.

Write Today for Full Details

KOMNICK MACHINERY COMPANY, Inc.
Lafayette Building, Detroit, Michigan

SUPERBESTOS Brake and Friction Blocks
SUPERBESTOS Hydraulic Compressed Brake Lining

SUPERBESTOS

For Every Type of Hoisting Equipment **Designed Especially for Severe Service**

We are pioneers in the manufacture of these materials. Efficiency, long service and exact sizing guaranteed.

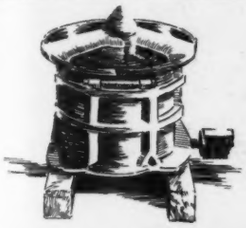
Write for prices and samples

THE MIKESELL COMPANY
1223 South Wabash Avenue **Chicago, Illinois**

It is part of Rock Products' conception of its duty to readers and subscribers to help them in every possible and legitimate way. The "Situations Vacant" and "Situations Wanted" advertisements are a part of this service. The charges of 2 cents a word, or a minimum charge of a dollar per insertion, are nominal and not designed for profit. Numerous letters from these advertisers assure us of the effectiveness of these advertisements in finding capable men for openings and of finding openings for capable men.

When writing advertisers, please mention ROCK PRODUCTS

PROTECT CRUSHERS

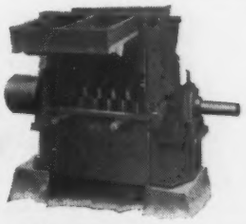


—and pulverizing equipment against tramp iron and its attendant costly wreckage and shut down. Provide assured protection with High Duty Magnetic Separators. Greater magnetic power and greater capacity. Write for bulletins.

Magnetic Mfg. Company
279 23rd Ave. Milwaukee, Wis.

HIGH DUTY Magnetic Separators

The New Jeffrey Pulverizer Catalog No. 450-A is ready. Write for your copy.



The capacities of Jeffrey Swing Hammer Pulverizers range from 5 to 500 tons per hour

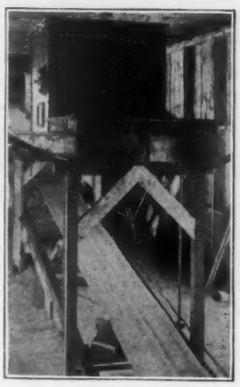
The Jeffrey Manufacturing Co.
935-99 N. Fourth St., Columbus, Ohio

KERLOW
GRATING PRODUCTS
JERSEY CITY, N. J.

GRATINGS and SAFETY STEPS
For Industrial, Marine and Architectural Purposes

Write for Catalogue F66E

KERLOW STEEL FLOORING COMPANY
218-224 Culver Avenue Jersey City, New Jersey



THE MERRICK CONVEYOR WEIGHTOMETER

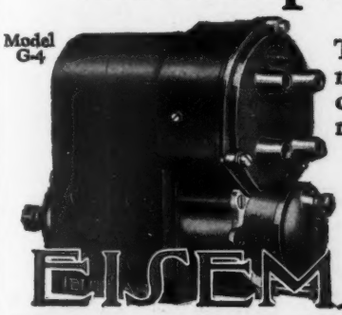
Any material which is conveyor-handled can be weighed without additional handling or loss of time by the Merrick Conveyor Weightometer.

An Automatic—Continuous—Accurate Record

MERRICK SCALE MFG. COMPANY
Passaic, N. J.

Incomparable

Model G-4



The world's premier magneto. Standard of the construction machinery industry.

EISEMANN

EISEMANN MAGNETO CORPORATION, 165 Broadway, N.Y.

for ***Efficient, Economical Haulage***

AUTOMATIC AERIAL TRAMWAY

INTERSTATE EQUIPMENT CORP.
25 CHURCH ST. NEW YORK CITY

Owen Buckets

GREATER DIGGING POWER
FASTER OPERATION
LONGER LIFE
GUARANTEED AGAINST BREAKAGE
and
"A MOUTHFUL AT EVERY BITE"

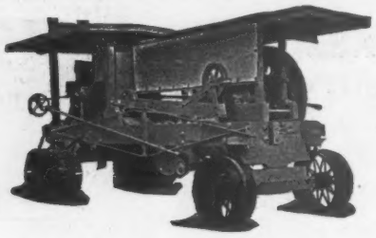
THE OWEN BUCKET CO.
6021 BREAKWATER AVENUE CLEVELAND, OHIO

L. O. X.

LIQUID OXYGEN EXPLOSIVE

A powerful, cheap and safe substitute for dynamite and powder which greatly reduces blasting costs in open pit operations.

KEITH DUNHAM COMPANY
110 South Dearborn St. Chicago, Ill.



The "CLIPPER" late improved Blast Hole Drill. The "CLIPPER" predominates, has stood the test and is approved by critics. Furnished also in the round wheel.

THE LOOMIS MACHINE COMPANY
(Established 1842)
15 E Street - - - Tiffin, Ohio

Raymond Mills and Pulverizers

for grinding all kinds of materials

The Raymond Bros. Impact Pulverizing Company
1307 North Branch Street
CHICAGO

THEW AND THEW ONLY HAS THE CENTER DRIVE!

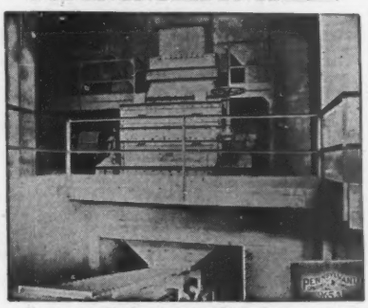
LORAIN 60 **THEW** LORAIN 75

Shovels, Cranes, Draglines and Backdiggers

THE THEW SHOVEL COMPANY
LORAIN OHIO

Perforated Metals—Screens of All Kinds—For Sand, Gravel, Stone, Etc.
MATERIAL IN STOCK
PROMPT SHIPMENT
CHICAGO PERFORATING CO.
2427 to 2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

"PENNSYLVANIA" HAMMERMILL



Put your Reduction Problems up to us.

STEELBUILT

preparing Primary Crusher output for pulverizing in one dependable reduction.

UNBREAKABLE STEEL FRAME.

ADJUSTABLE STEEL CAGE.

POSITIVE TRAMP IRON PROTECTION.

50 "Pennsylvania" types and sizes for Primary, Secondary and Finer reductions in cement, lime and gypsum plants.

PENNSYLVANIA CRUSHER COMPANY
Liberty Trust Bldg.
PHILADELPHIA
New York Pittsburgh Chicago

ROBERT W. HUNT CO.
Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories
CHICAGO
New York St. Louis 2200 Insurance Exchange Kansas City Cincinnati Pittsburgh San Francisco

Locomotive Cranes and Shovels

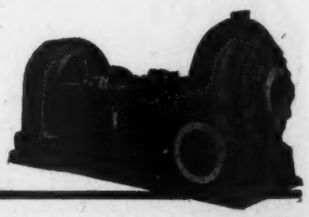
Industrial Brownhoist builds a complete line of locomotive cranes ranging in capacity from 7½ to 60 tons and shovels from ½ yd. to 1¼ yds. capacity. Gas, steam, electric or Diesel powered on creeper or railroad truck mountings.

OTHER PRODUCTS
Belt and Chain Conveyors, Bucket Elevators, Bridge Cranes, Clamshell Buckets, Portable Storage Bins.

Industrial Brownhoist Corporation
Cleveland, Ohio
INDUSTRIAL BROWNHOIST

MORRIS CENTRIFUGAL PUMPS

For hydraulic dredging, filling, sand and gravel production, hydraulic conveying of slurry and other liquids with semi-solid content. Types and sizes for the largest or smallest operations, and belt, motor, steam or gasoline-engine drive.



Write for Bulletin No. 125

Morris Machine Works
Baldwinsville, N. Y.

NORBLO

Dust Collecting Equipment

TRADE MARK

There's a NORBLO System for Every Need

NORTHERN BLOWER COMPANY
West 65th St. & Denison Ave. Cleveland, Ohio

DUSTY OPERATIONS MADE DUSTLESS BY PANGBORN

Consult us on any phase of Dust Suppression and Collection for any industrial operation.

Pangborn Corporation
Sand-Blast and Dust Suppression Equipment, Hagerstown, Md.

BUDA INDUSTRIAL POWER

Heavy-Duty Engines and Power Plants

For locomotives - shovels - hoists - stone crushers - compressors - and similar equipment

NINE SIZES—Write for specifications

THE BUDA COMPANY
HARVEY (Chicago Suburb) ILLINOIS

STREET

Slackline Excavators-Hoists Cableways-Derricks

"ALWAYS GIVE SATISFACTION"

Street products are chosen for the most difficult work by leading engineers and contractors. We will be glad to tell you about any Street product and to refer you to satisfied Street users in all parts of the country. Write us today, stating your requirements.

Street Bros. Machine Works
Chattanooga, Tennessee

STREET SLACKLINE BUCKET—a real digging bucket with back dump, and pull in front of digging blade. Has many exclusive advantages.

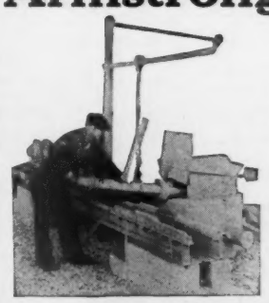
American Steel & Wire Company's American Wire Rope and AERIAL WIRE ROPE TRAMWAYS

AMERICAN STEEL & WIRE COMPANY

Sales Offices: Chicago, New York, Boston, Atlanta, Birmingham, Cleveland, Worcester, Philadelphia, Pittsburgh, Buffalo, Detroit, Cincinnati, Baltimore, Wilkes-Barre, St. Louis, Kansas City, Minneapolis-St. Paul, Oklahoma City, Memphis, Dallas, Denver, Salt Lake City, *San Francisco, *Los Angeles, *Portland, *Seattle. **United States Steel Products Co.*

Armstrong Bit Dresser

For Churn Drill Bits



Whether you operate one Blast Hole Drill or a dozen, the Armstrong Drill Bit Dresser will soon pay for itself in time and labor saved—in reduced costs—in increased production—in added profits. This has already been proven in 150 quarries and open pit mines.

Write for Special Bit Dresser Circular.

ARMSTRONG MFG. COMPANY
801 CHESTNUT ST. WATERLOO, IOWA, U. S. A.
See Page 203 of 1927 Keystone Metal Quarry Catalog

STURTEVANT

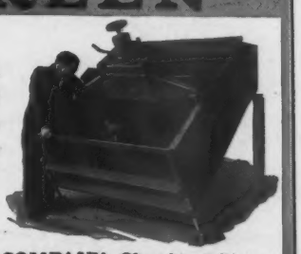
Crushing, Granulating, Pulverizing, Shredding, Air-Separating, Screening, Grading, Mixing, Weighing, Sampling, Elevating and Conveying Machinery

Standardized and special units ready to erect.

ENGINEERS, DESIGNERS, CONSULTANTS, ERECTORS, OPERATORS

STURTEVANT MILL CO. HARRISON SQUARE Boston, Mass.

HUM-MER Electric SCREEN



Screens from coarsest to the finest materials- either wet or dry

Catalogue sent upon request

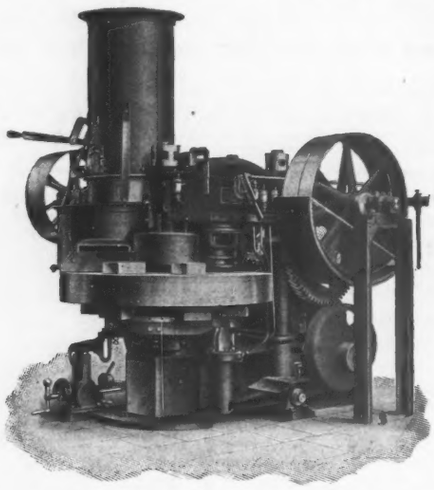
The W. S. TYLER COMPANY- Cleveland Ohio.

WOVEN WIRE SCREEN

What Competent and Efficient Sales Agency Would Take an Interest in Selling Most Improved and Capable

Sand-Lime Brick Presses

and Complete Plants?



DR. BERNHARDI SOHN, EILENBURG
Near Leipzig
Machine Works Established 1854

CROSS ENGINEERING CO. CARBONDALE PA. PERFORATED SHEET METALS CE

Our screens produce a product clean and perfectly sized.
We can supply repair and renewal parts quickly and correctly. Rush orders can be filled promptly because of our stock of 500 tons or more of steel plates.

Cross Engineering Company
Offices and Works:
Carbondale, Pa.

Rails

also—
FROGS & SWITCHES
SPIKES, BOLTS, TIE PLATES
CROSS TIES, SWITCH TIMBER
ACCESSORIES

New and Relay

Morrison & Risman Co., Inc.
McCormick Bldg. CHICAGO
1437 Bailey Ave. BUFFALO
Warehouses Buffalo Chicago Indianapolis Pittsburgh

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED—POSITIONS VACANT
Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

USED EQUIPMENT

MACHINERY FOR SALE

JAW CRUSHERS—2½x4; 4x12; 8x10; 9x15; 10x20; 12x24; 13x30; 24x36; 30x42; 60x84.

GYRATORY CRUSHERS—All sizes, various makes.

CRUSHING ROLLS—8x5; 20x14; 21x11; 24x10; 24x14; 30x16; 36x16; 42x16.

DRYERS AND KILNS—Single shell—3½x16; 4x20; 4x30; 4'9"x36; 5x25; 5x50; 5½x40; 6x40; 7x70; 7x100; 8x80; 9x124; Double shell—3x16; 4x20; 5x30; 6x40; 8x85.

TUBE MILLS—3'x12", 4x16; 5x20; 5x22; 5'6" x16; 5'6"x20.

HARDINGE MILLS—3'x8"; 4½x16; 5x22; 6x22; 8x30; 8x36; 8x48.

PULVERIZERS—2-, 3-, 4-, 5-roll, high and low side Raymond Mills, also Beater types; 33" to 42" Fuller Lehigh Mills, Griffin Mills.

SWING HAMMER MILLS—All sizes—Williams, Jeffrey, Gruendler, Pennsylvania.

Send us your inquiries
Send us a list of your surplus equipment

Consolidated Products Company, Inc.
15-16-17 Park Row N. Y. C. Barclay 0603
Shops and Yards at Newark, N. J., cover 5 acres

REBUILT LOCOMOTIVES

72-ton American 6-wheel switcher, separate tender, 180 lb. steam. Three duplicates.
54-ton Baldwin 6-wheel switcher, separate tender, 200 lb. steam; built 1913.
50-ton Baldwin 6-wheel switcher, separate tender; built 1907.
43-ton Baldwin 6-wheel switcher, separate tender, 180 lb. steam; built 1917.
35-ton Baldwin 4-wheel switcher, separate tender, 180 lb. steam; built 1921.
42-ton American 4-wheel saddle tank, 180 lb. steam; built 1910; Ohio boiler.
31-ton Baldwin 4-wheel saddle tank, 160 lb. steam; built 1914.
21-ton Porter 4-wheel saddle tank; built 1912. 36" gauge.
18-ton Porter 4-wheel saddle tank, built 1910-11, 36" gauge. 3 duplicates.

REBUILT DUMP CARS

20-yard all steel Western air dump, vertical cylinders. Ten of these.
12-yard steel underframe hand dumps. Seven of these.
6-yard steel underframe hand dumps. Eight of these.

REBUILT LOCOMOTIVE CRANES

22½-ton Ohio 8-wheel 2-line; built 1915.
20-ton Link-Belt 8-wheel, 2-line; built 1916.
15-ton Ohio 8-wheel, 2-line; built 1919.

BIRMINGHAM RAIL & LOCOMOTIVE COMPANY
Birmingham Alabama

GAS SHOVELS & CRANES

1—Orton ¾-yd. crawling tread Shovel & Crane.
2—P. & H. 206, ¾-yd. crawling tread Shovels or Cranes.

CRANE ATTACHMENTS

1—Osgood 40' crane or drag line boom with drum and ¾-yd. clam shell or ¾-yd. drag line bucket.

ELECTRIC HOISTS

1—75 H.P. three drum electric with attached swinger, complete with controls, 2 phase, 60 cycle, 220/440 volt.

STEEL DERRICKS

1—10 ton steel Guy Derrick, 75' boom.
1—10 ton steel Guy Derrick, 60' boom.
1—15 ton steel stiff leg Derrick, 68' boom.

REDUCTION CRUSHERS

Telsmith, Symons, Kennedy and Traylor, all sizes.

JAW CRUSHERS

Sizes 4x5 to 24x36.
Gyratory Crushers, size 2 to 10K.

RING ROLL MILL

Sturtevant No. 2 Duplex, used two months.

A. J. O'NEILL COMPANY
406 Weightman Bldg. Philadelphia, Pa.

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED—POSITIONS VACANT
Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

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USED EQUIPMENT

MUST BE SOLD AT ONCE — REAL BARGAINS

Located at Benson Mines, St. Lawrence County, N. Y.

Below is a brief inventory of the plant. If you do not see what you want, write us and full inventory will be mailed you.

2—No. 70 BUCYRUS STEAM SHOVELS.
1—5'x6' EDISON GIANT CRUSHING ROLLS.
2—36"x36" GIANT CRUSHING ROLLS.
1—18"x30" GIANT SMOOTH ROLLS.
1—18"x24" SPIKE CRUSHING ROLLS.
2—8'x6' KENNEDY BALL MILLS.
2—33-ton Standard Gauge SADDLE TANK LOCOMOTIVES.

2—304 hp. B. & W. RUST BOILERS.
36—SKIPS, 7½ yd. all steel with
20—Skip CARS, Standard Gauge.
2—10 ft. MORGAN Mechanical GAS PRODUCERS.

4—DEWATERING MACHINES.
WROUGHT IRON AND CAST IRON PIPE.
2—NEWAYGO SCREENS, Class E, No. 3.
4—CYCLONE DRILLS (Core).
1—CARWELL 36-in. Track Gauge BELT CONVEYOR TRIPPER.
1—ELEVATOR, 75' centers. Elevator complete with tail pulley and take-up bearings with 150 "V" shape 9x12x16 steel buckets with reinforced edges, with 17" stitched canvas 6-ply belt.
2—ELEVATORS, 26" width, 60' centers, 6-ply rubber belt, with 160 6x7x12 inch malleable buckets.
1—ELEVATOR, 25' centers, 22" 6-ply rubber belt, with 55 10x12x21" reinforced edge steel buckets.
325—9x12x12" "V" shape ELEVATOR BUCKETS.
7—42"x48" TRUMMER SCREENS.
1—22"x60" CORLISS ENGINE.
A LOT OF NEW SPUR GEARS AND SPROCKETS.
1—DAVIS STEAM POWER 3⅛" CORE DRILL.
1—¾-yd. ORANGE PEEL BUCKET.
1—⅝-yd. ORANGE PEEL BUCKET.
7000—2½x4½x9" FIRE BRICK; new.
2000—KILN LINING BRICKS, 3¼x6x9"; new.
200 tons 60-lb. RE-LAYER RAILS with 10 sets Frogs and Switches.
QUANTITY OF SMALLER RAILS.
4—4-yd. WESTERN WHEELED DUMP CARS.
1—No. 80 STURTEVANT EXHAUST FAN.
1—No. 55 STURTEVANT EXHAUST FAN.
1—No. 36 STURTEVANT EXHAUST FAN.
1—PIPE THREADING MACHINE, 2" to 6".
1—BLACKSMITH FURNACE AND BLOWER.
1—FRANKLIN PORTABLE CRANE HOIST.
1—No. 13 NIAGARA SHEAR. Will cut iron up to ⅜".

Steel Buildings

1—45' wide, 136' long by 75' high (4 floors).
1—76' wide, 143' long, 36' high.
1—34½' wide, 47' long, 75' high.
1—40' wide, 126' long, 30' high.
1—40' wide, 40' long, 50' high.
1—"U" Shape ALL STEEL STORAGE BIN, capacity about 200 tons of coal.
3 ph., 60 cycle, 440 volts, MOTORS, varying from 25 hp. to 200 hp.
3—300 KVA TRANSFORMERS.
1—100 kw. GENERAL ELECTRIC STEAM TURBO GENERATOR SET.
1—Single Drum STEAM HOIST, cylinder 8x12", drum 12x18".
1—VULCAN, Single Drum, double cylinder STEAM HOIST, cylinders 4x8", drum 6x15".

At Other Points

8'x125' ROTARY KILNS.
9'x100' ROTARY KILNS.
7'x120' ROTARY KILNS.
7'x100' ROTARY KILNS.
7½'x80' ROTARY KILNS.
7'-5½'x60' ROTARY KILNS.
5½'x36' ROTARY DRYERS.
5½'x60' ROTARY DRYERS.
8'x80' ROTARY DRYERS.
8'-8"x85' ROTARY DRYERS.
1—5'x33' ROTARY VACUUM DRYER.
No. 7½ KENNEDY GYRATORY CRUSHER.
No. 9-K ALLIS-CHALMERS GYRATORY CRUSHER.
No. 6 McCully GYRATORY CRUSHER.
No. 6 KENNEDY GYRATORY CRUSHER.

Also a Large Stock of Other Crushers

THE EQUIPMENT SALES COMPANY

Richmond, Va. — **R. W. Storrs, Jr., Manager** — **Address reply to Benson Mines, N. Y.**

New—Standard Make

1½ cu. yd. Steam and Electric

SHOVELS

At Greatly Reduced Prices

A two motor electric shovel equipped with 50 hp. hoist and swing motor, and 20 hp. crowd motor. High lift—heavy duty—factory guaranteed.

Also a new heavy duty, high lift steam shovel. Can be equipped with boom up to 32 feet in length.

Either machine recommended for severe operation requiring large output.

Terms to Meet Your Convenience

CHAS. F. COHEN
132-5 Cornell Ave. Elyria, Ohio

UNIVERSAL CRUSHER COMPANY
Eastern Agents

All Steel Jaw Crushers. Also used equipment in crushing and power lines.

HOOPER-MOMBERGER CO.
90 West St., New York City Phone Rector 2919

Crawler Shovels

1—OSGOOD HEAVY DUTY (1-yd.), GASOLINE Caterpillar, new 1927, 1-yd. dipper; HIGH LIFT; also 40-ft. crane boom if desired, like new.
1—ERIE B-2 DREADNAUGHT, Steam Caterpillar, new 1927, 1-yd. dipper; HIGH LIFT, overhauled, perfect condition.

Cranes

1—NORTHWEST, Model 105, GASOLINE Caterpillar Crane, new 1926, 40-ft. boom, bucket operating, overhauled, excellent condition.
1—15-ton, LINK-BELT, K-2, GASOLINE Caterpillar Crane, new 1926, 50-ft. boom, bucket operating, overhauled.

Grey Steel Products Company
111 Broadway New York, N. Y.

RAILS New and Relay

ALL WEIGHTS AND SECTIONS
FROGS—SWITCHES—TIE PLATES

S. W. LINDHEIMER
38 S. Dearborn St. Chicago, Ill.

FOR SALE

4½x12' Allis-Chalmers Tube Mill with new manganese lining.
3-, 4- and 5-roll Raymond Mills.
Infant, No. 2 and No. 6 Williams Mills.
33" and 42" Fuller-Lehigh Mills.
30" and 13" Farrell Jaw Crusher.
80"x45' and 8'8"x85' Ruggles-Coles Dryers.
4½x52½' Rotary Dryer or Calciner.
8'x80' Rotary Dryer, single shell.
42"x40' Rotary Kiln, cement lined.
Style A-2 and B-1 Broughton Mixers.

ROBERT P. KEHOE MACHINERY CO.
7 East 42nd St. New York, N. Y.

FOR SALE

New and used Rotary Dryers. Write us your requirements.

McDERMOTT BROS. CO.
Allentown, Penna.

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT

MACHINERY FOR SALE

SPECIAL

One No. 6 Williams Universal Pulverizer.
One new 8'x125' Kiln.

ROTARY CRUSHERS

Three No. 00, Three No. 1, One No. 1½, One No. 2 Sturtevant Rotary Fine Crushers, One No. 0, One No. 1 Sturtevant Ring Roll Mills.

GYRATORY CRUSHERS

All sizes from No. 2 Reduction up to 12K.

JAW CRUSHERS

One 4"x8", Two 7"x10", Two 9"x15", One 6"x20", One 10"x15", One 10"x20", Two 12"x24", One 13"x30", One 15"x36", One 18"x36", One 24"x36", One 22"x50", One 36"x48", One 40"x42", One 60"x84".

CRUSHING ROLLS

One 8"x6", Two 14"x20", Two 16"x10", One 24"x12", Three 30"x10", Two 36"x16", Two 42"x16, and One 54"x24" Crushing Rolls.

DRYERS

One 3'x20', Three 4'x30', One 5'x40', Two 5½'x 40', One 6'x60', One 7'x60', and Two 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30' Ruggles Coles type "A" and One 4'x 20' Ruggles Coles type "B" Double Shell Rotary Dryers, Three 6'x25' Louisville Dryers.

KILNS

One 4'x40', Two 6'x60', Two 6'x90', One 6'x 100', One 6'x120', One 7½'x80', Three 8'x 125'.

HARDINGE MILLS

One 4½', Two 6' and Two 8' Hardinge Mills.

SWING HAMMER AND TUBE MILLS

Fuller, Griffin and Raymond Mills, Screens, Air Separators, etc.

THE HEINEKEN ENGINEERING CORP.
117 Liberty St. New York City

Telephone Cortlandt 5130

USED EQUIPMENT

Crushers No. 12, 10, 9, 8, 7, 6, 5, 4
Roll Crushers
84x72, 36x60, 72x30, 18x30
60x84—Jaw Crushers—16x60
36x48—40x42—26x50—24x36—20x34—60x84
12x37—18x36—13x30—7x24—7x16—10x22
2—30 and 37 Kennedy Gearless Crushers.
DISC CRUSHERS, 48", 36", 24", 18"

3 Oil Engines 200 H. P., New
¾—1 AND 1½—2½-YD. CAT SHOVELS
5 Ton Crane 70' Span A C Motors
AIR COMP.—HOISTS—KILNS
DRAG LINES—LOCO. CRANES—MOTORS

Ross Power Equipment Co.
13 South Meridian St. Indianapolis, Ind.

Bargain Prices
100,000 Lbs. Capacity
ALL STEEL ORE HOPPER DUMP CARS
MCB condition. Ready for service.
Cheap freight to any part U. S. A.
DULUTH IRON & METAL COMPANY
Duluth, Minn.

USED EQUIPMENT

CRUSHER BARGAINS

Kennedy No. 30 Gearless breaker 30"x 115". Capacity 400 to 800 tons per hour.

Kennedy No. 37 Gearless Reduction Crusher. Capacity 25 to 100 tons per hour.

Gates 7½-K. Fine condition.

4—Hardinge 36" Mills with Feeding Device. Bronze worm gear & Receiving Hopper for finished product. Motor or Belt drive.

Allis-Chalmers Fairmount type 36"x60" Crusher Rolls.

Other Crushers, All Types and Sizes on Hand
F. MAYER
Monadnock Bldg. Chicago, Ill.

FOR SALE

1—Jeffrey type D, ball-bearing Pulverizer (Hammer-Mill) with extra parts. $750.00 f.o.b. East Liberty, Ohio. We guarantee this machine to be in good working condition.

EAST LIBERTY STONE COMPANY
1019 Lima Trust Bldg. Lima, Ohio

In stock 250—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge: rails, new and relaying and all sorts of tracks supplies of all sections.

Park Row Bldg. New York City **M. K. FRANK** Union Trust Bldg. Pittsburgh, Pa.

---

32 ton, American, 32-in. wheel centers, 175 lbs. pressure, air and steam brakes; completely overhauled.

75 ton, 21x26-in., 6-wheel switcher, piston valve, Walschaert valve gear, superheated; built Dec., 1922.

50 ton, saddle tank, new boiler, new cylinders, new tank, new tires.

17—16-yd. Western dump cars, rebuilt; new bodies, steel lined floors.

10—20-yd. Western dump cars, all steel, vertical air cylinders.

HAVE FORTY LOCOMOTIVES, OVERHAULED AND READY, 5 TO 100 TONS, CARS, SHOVELS, CRANES, RAIL, ETC.

ALSO
LOCOMOTIVE SPRINGS, MANUFACTURED AT OUR WORKS HERE

SOUTHERN IRON & EQUIPMENT COMPANY
(Est. 1889)
ATLANTA - - - - - GEORGIA

FOR SALE

1—75 H.P. Electric Stripping Outfit.
1—Gas Portable Core Drill.
1—No. 3 Gates Gyratory Crusher with Screens.
1—No. 9-K Gates Gyratory Crusher.
2—No. 8-D Gates Gyratory Crushers.
1—No. 5 Telsmith Gyratory Crusher.
1—No. 7 Williams Fine Grinder.
1—No. 7½-D Gates Gyratory Crusher.
1—18"x36" Farrell Jaw Crusher.
1—36"x48" Traylor Bull Dog Crusher.
1—No. 6 Austin Gyratory Crusher.
2—No. 5-K Gates Crushers.
1—Complete 400 Yard Gravel Plant.
1—Complete Small Stucco Plant.
1—6'x22" Hardinge Conical Ball Mill.
1—41-ton Baldwin Standard Gauge Locomotive.
2—Complete ¾-yd. Gas Cableway Outfits; 1 steam.
1—Sauerman 1-yd. Outfit, without power.
1—Sauerman 2-yd. Electric Outfit, complete.
1—New 200 H.P. G. E. Motor.
1—65' Center Bucket Elevator.
50—Steam and Electric Channelers.
1—33" Fuller Mill.
1—3'x30' Indirect Fired Dryer.
1—42" Gas Whitcomb Locomotive.
1—150' Matthew Gravity Conveyor.

Send us your inquiries and we will send you our offerings from our $15,000,000 Listing.

National Equipment Company
Bloomington, Indiana

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT

12-ton Vulcan Gasoline Locomotive, Class EW-12-4 speed worm gear drive.
8-ton Whitcomb Gasoline Locomotive.
4-ton Whitcomb Gasoline Locomotive.
45—Koppel 2-yd. 2-way All Steel Cars, Catalog 1183.
All above equipment is 36-in. gauge; purchased new last year; used only on one job.

ARTHUR S. PARTRIDGE
417 Pine Street St. Louis, Mo.

BIDS AND PROPOSALS

FOR SALE
Railroad Track Equipment

The United States of America, represented by the United States Shipping Board, acting by and through the United States Shipping Board Merchant Fleet Corporation, invites bids on the following property located at and in place in railroad tracks at Hog Island, Penna.:

APPROXIMATE QUANTITIES

		Feet
6,354 tons (gross) 85	lb. Steel Rail—	502,384
262 tons (gross) 67½	lb. Steel Rail—	25,957
56 tons (gross) 60	lb. Steel Rail—	6,315
31 tons (gross) 30	lb. Steel Rail—	6,939
17 tons (gross) 85	lb. Guardrail—	1,444
8 tons (gross) 60	lb. Guardrail—	1,144

264 each Switches
616 each Switchrails
300 each Frogs
570 each Guardrails
19 each Electric Switches
21 each Signal Semaphore Towers
26 each Buda Bumping Posts
6 each Double Switches
16 each Double Frogs
3 each Water Tower Hydrants
2 each "Hays" Safety Frogs
7 each Turntables, for 30 lb. Rail
12 each Signal Switches
1 each 300,000 lb. Fairbanks Railroad Track Scale
Nuts, Bolts, Spikes, etc.

Bids, which must be on prescribed form, will be received at the office of the Merchant Fleet Corporation, Room 1713, Navy Building, Washington, D. C., until 2:00 P. M., Eastern Standard Time, May 21, 1928. The right is reserved to reject any and all bids. For Sales Proposal S. D. No. 66, terms and conditions of sale, and form of bid, communicate with

Supply Department
United States Shipping Board
Merchant Fleet Corporation
Room 1713, Navy Building
Washington, D. C.

USED EQUIPMENT WANTED

DRAGLINE WANTED

About 1 yd. bucket, boom 50 ft. or longer. Oil engine driven preferred but will consider gasoline. In submitting offer advise make, age, exact condition, with photographs and full specifications. Also several good oil engines. Address

Box 148, care of Rock Products
542 So. Dearborn St. Chicago, Ill.

USED EQUIPMENT WANTED

WANTED
1—Good second-hand No. 6 Gyratory Crusher.
1—Good second-hand dryer, 10 tons per hour capacity.
1—Type G Kent Maxecon Mill, must be in good condition.
Quote us lowest Cash Price and point of shipment.

Box 145, care of Rock Products
542 So. Dearborn St. Chicago, Ill.

BUSINESS OPPORTUNITIES

GYPSUM
Mining, Quarrying, Processing, Construction, and Research

The undersigned is available for consultation and service to the Gypsum Products Industry in connection with all problems relating to the production and use of gypsum plaster, stucco, wallboard, tile, etc. I have facilities for testing and research work, and a background of successful experience as a chemist and superintendent of gypsum plants.

Walter B. Lenhart
265 Quincy Ave., Long Beach, Cal.

FOR SALE
Two deposits of limestone in northwest Florida—both large tonnage and high grade. Railroad runs through one and no great distance from other. Should interest cement manufacturers. Address

S. D. CRENSHAW
P. O. Box 667 Richmond, Va.

FOR SALE
Full operating Sand Plant, located in a prosperous manufacturing city of 40,000 population, 18 miles from Philadelphia, Penna. Consists of 14 acres very highly tested sand. Plant equipped with most modern machinery and screw washers, installed April, 1927. Have more orders than can be filled at $1.40 per T. at plant. On account of illness will sell at a reasonable figure. Act quickly. Address

Box No. 149, care of Rock Products
542 South Dearborn Street Chicago, Illinois

POSITIONS WANTED

GRADUATE MINING ENGINEER—NINE years nonmetallic mining experience, engineer to superintendent. Thoroughly familiar with the gypsum industry. Desire connection with company that will recognize executive and managerial abilities and one that offers a bright future. Very adept at handling men. Energetic hustler that can get results and assure lower costs. Address Box 136, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

SUPERINTENDENT WANTS CONNECTION, twenty years' practical experience, construction, and operation of crushed stone and gravel plants, thorough knowledge of drilling, blasting, shovel operations, transportation, conveying, and milling operations, location anywhere; excellent references. Address Box 139, care of Rock Products, 542 South Dearborn Street., Chicago, Ill.

SUPERINTENDENT—DESIRES ENGAGEment; thoroughly familiar with stone crushing, sand and gravel operations; competent and efficient operator; location South or West. Prefer working on bonus basis or tonnage contract. Excellent references. Address Box 99, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

POSITIONS WANTED

SUPERINTENDENT—20 YEARS' EXPERIence in mill and quarrying operations. Familiar with both steam and electric shovels and heavy drilling and blasting operations. At present employed. Can furnish complete record for whole period with best of references. Address Box 135, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

ENGINEER, EXPERIENCED IN DESIGN, construction and operation; cement, lime, crushing, pulverizing, conveying, ore handling and treating plants. Considerable experience in other industrial manufacturing lines. Address Box 2253, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

CEMENT CHEMIST—OVER 12 YEARS broad experience as chief chemist. Successful record; good references. Available now. Address Box 147, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

POSITIONS VACANT

QUARRY MAINTENANCE ENGINEER—Young man to take charge of maintenance and repair of modern equipment in large up-to-date quarry. Experience in gasoline engines and heavy repair work essential. Give experience, personal data and state salary expected in first letter. Address Box 146, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

WANTED—EXPERIENCED OPERATOR FOR 50-B or 32 Marion Electric. In Rock Quarry Work. No Boomers. Address Anna Stone Company, Anna, Illinois.

To Employers Who Advertise for Men:

These advertisements of "positions vacant" and "positions wanted" are all bona fide, and in a large majority of cases from firms and men known personally to one or more of the staff of Rock Products.

It sometimes happens, when an employer receives a number of applications for a position open, he neglects to acknowledge some of them.

As a matter of courtesy and good will in our relatively small and closely knit industries, the applicant should receive some acknowledgement. If the employer does not wish to disclose his identity he may make the acknowledgement on plain letter paper.

The applicant is, in practically every instance, a bona fide operating man in the rock products industry. Otherwise he would never see a copy of Rock Products, as it has no circulation outside of those definitely interested in the production of these commodities.

Unless the applicant receives some acknowledgement he does not know that his application forwarded through Rock Products has been properly taken care of or not; and a very good candidate for some future employment is discouraged from answering these blind advertisements, to the detriment of both employer and employe.

Therefore, for the good of all our industry, employers and employes, please treat such applications with the same courtesy you would any other business communication.

—The Publishers.

UNIVERSAL CRUSHERS

Here is a rock crusher that is satisfying thousands of users everywhere. *It will more than make good on your pay roll.*

Let Us Tell You More About It

Capacities to 450 tons daily

UNIVERSAL
Crusher Company
617 C Avenue West
Cedar Rapids Iowa

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Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Chicago, May 26, 1928 (*Issued Every Other Week*) Volume XXXI, No. 11

TIMKEN
Tapered
ROLLER BEARINGS

TIMKEN BEARINGS are featured in the new Rex-Stearns Timken troughing idlers. Down go costs on installation, belts, power, lubrication, and maintenance. Smaller motors, lighter terminals, lighter belts, and less belt tension are made possible by Timken Bearings.

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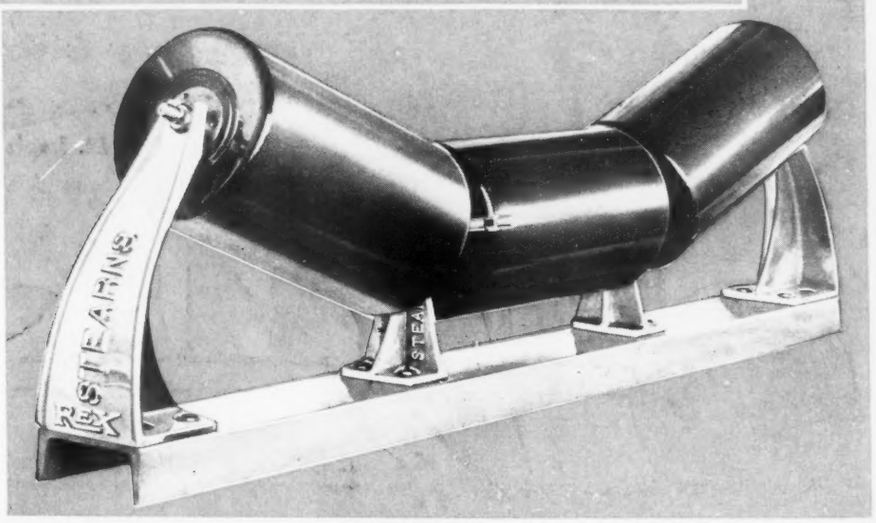
THE TIMKEN ROLLER BEARING CO., CANTON, OHIO



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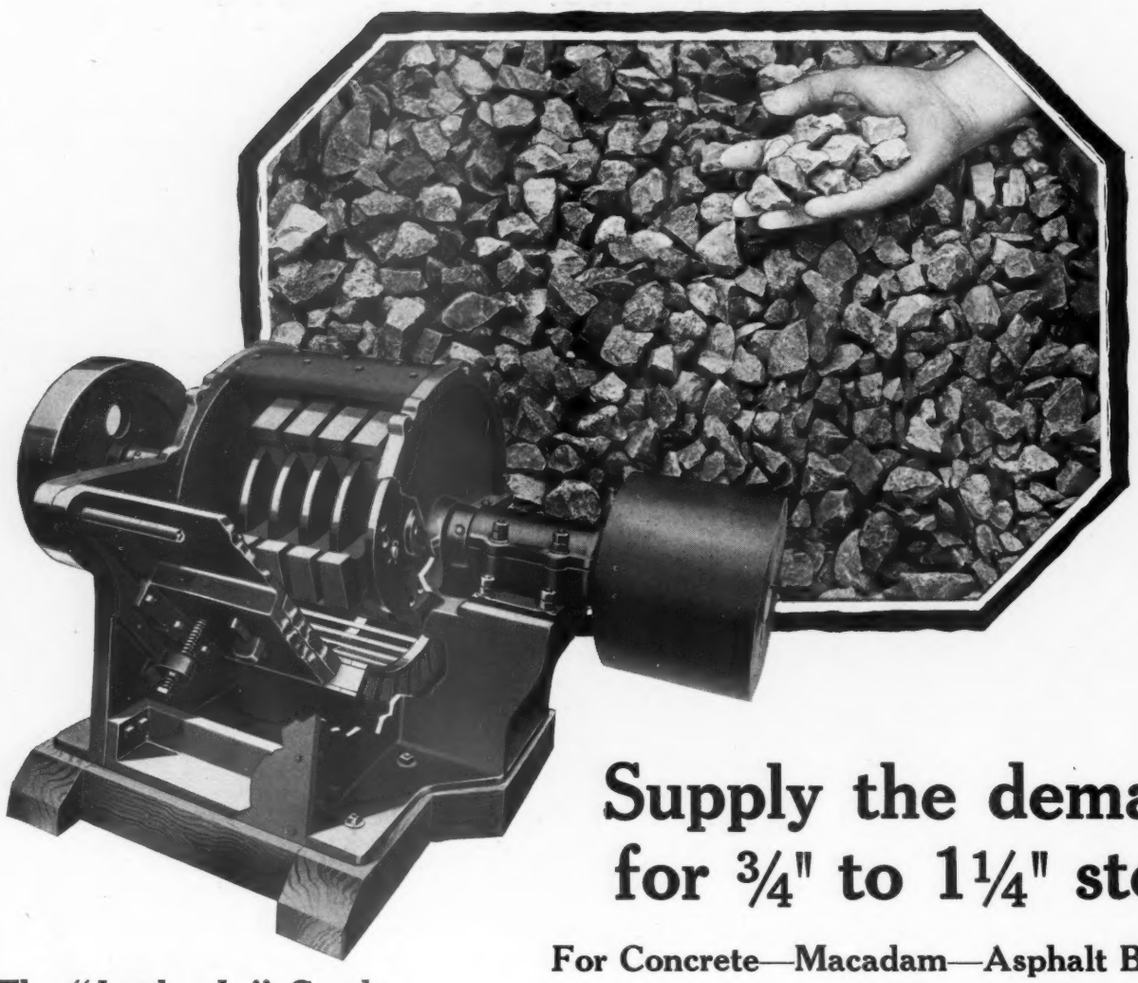

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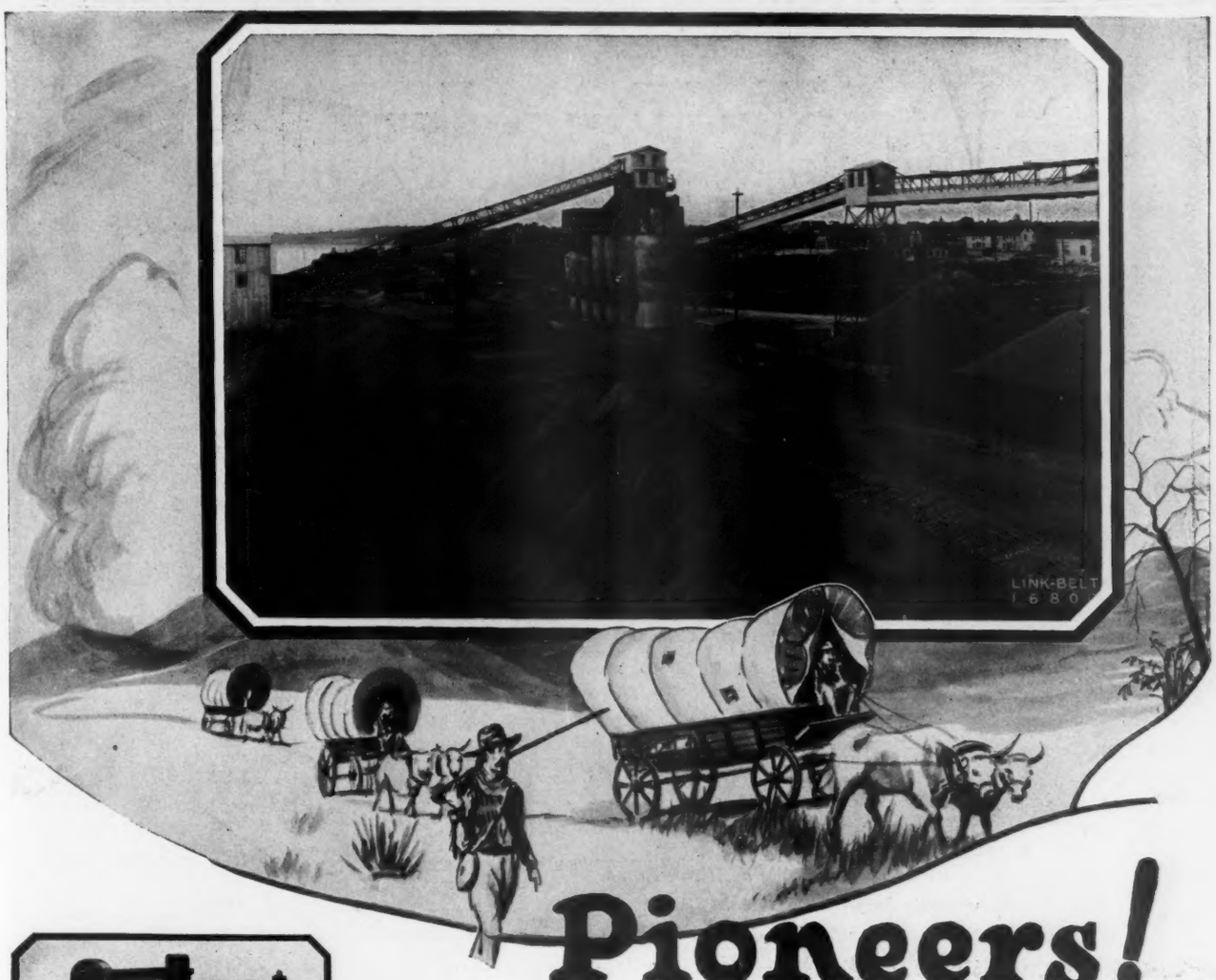

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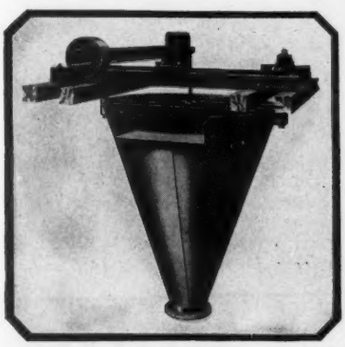

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Rock Products

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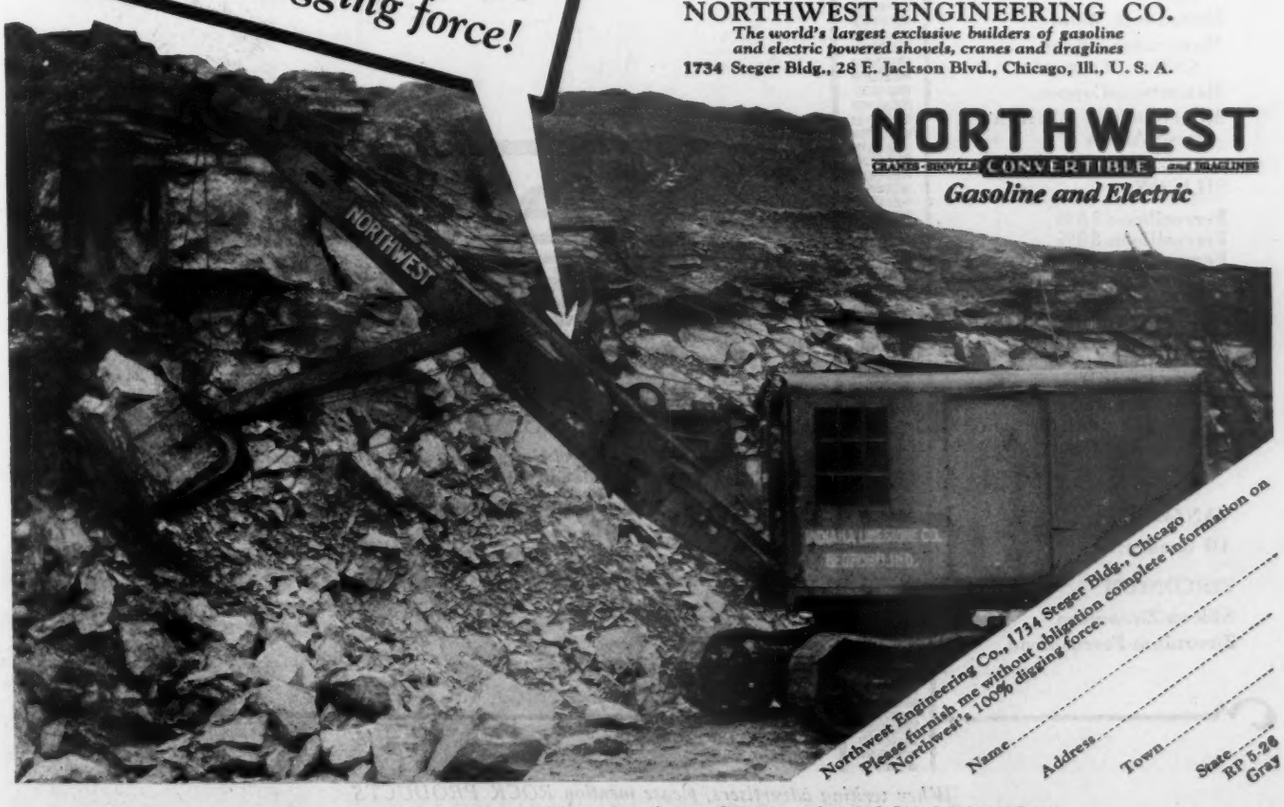

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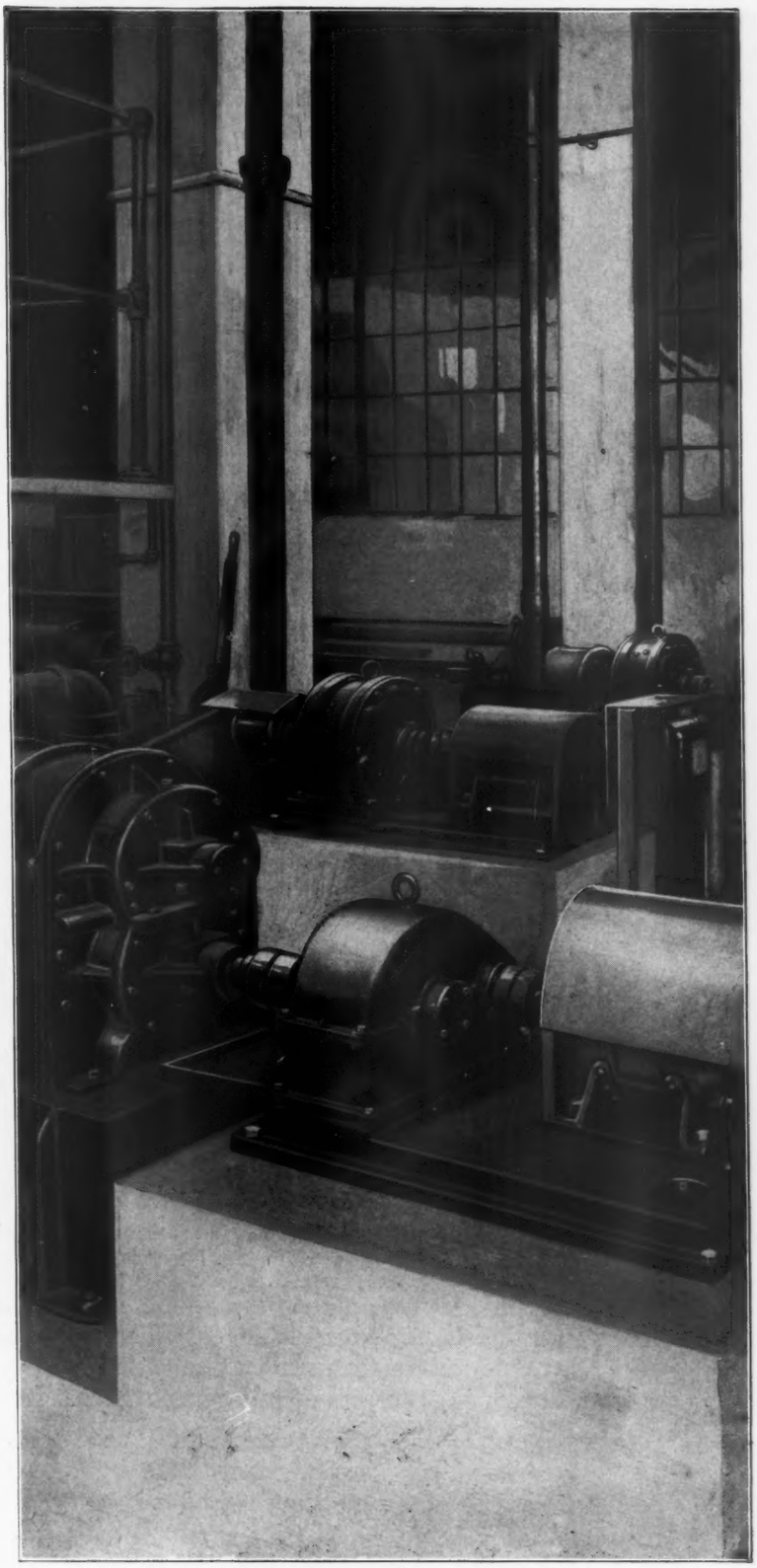

A group of James Planetary Direct Drive Spur Gear Speed Reducers and a James Generated Continuous-Tooth Herringbone Speed Reducer. Note that the Herringbone Unit is being used for the heavy work of driving a large pump, while the Spur Gear Units are driving average duty agitators. By fitting the correct drive to a given job, you get the best results. Only James can give you this kind of service.

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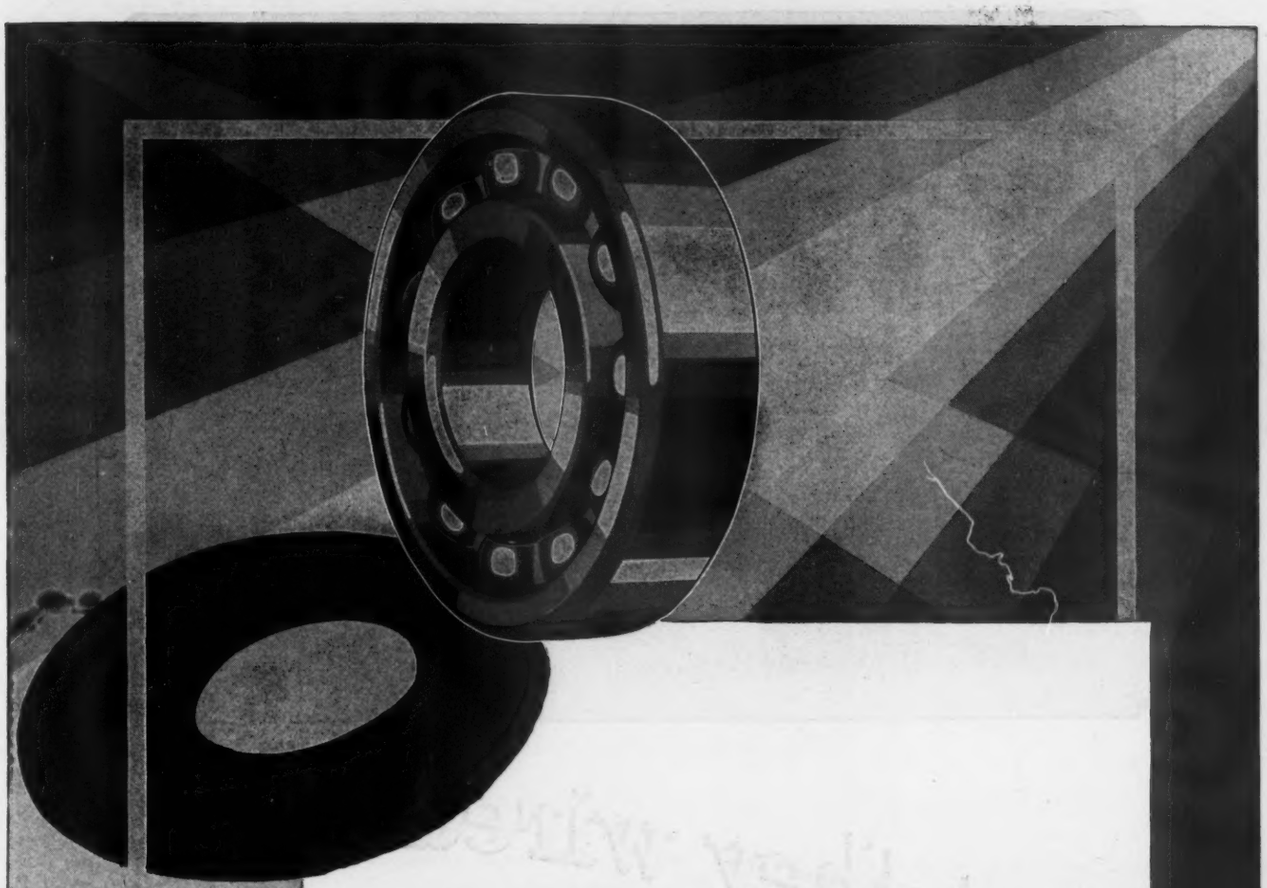

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Write us for bulletin on BUCYRUS-ERIE 2-, 3- and 4-yard heavy duty electric shovels, and get the facts on what these machines are doing for others—the best evidence of what they will do for you.

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Improving your methods and products
Reducing your production costs

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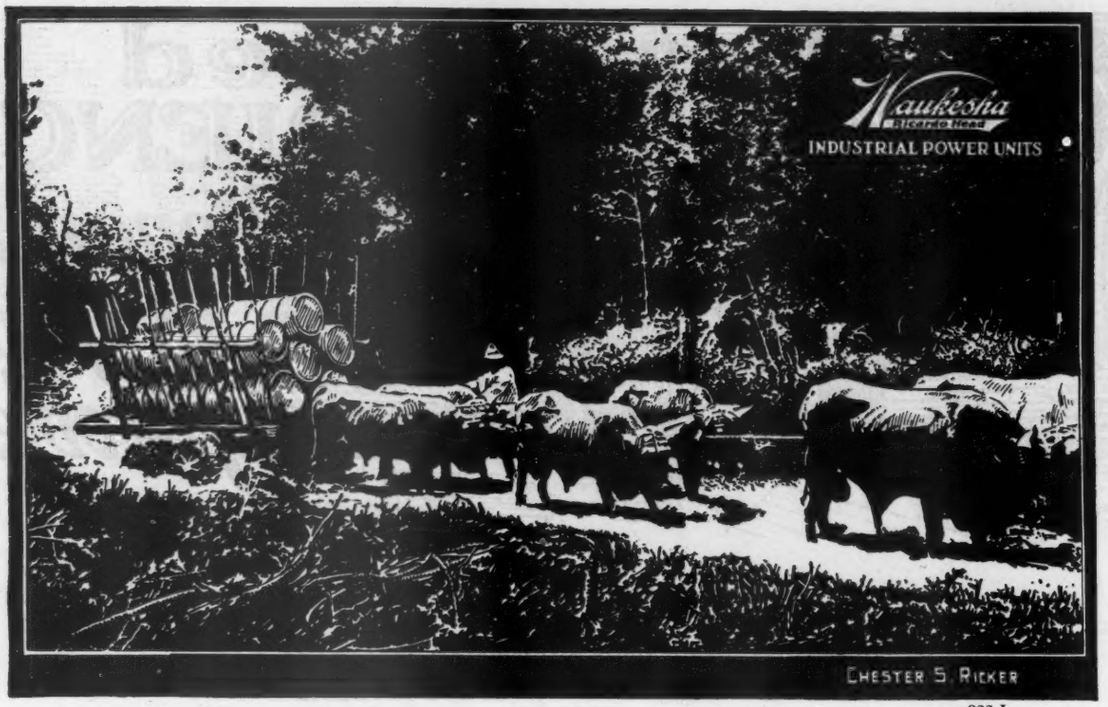


n-822-L

To keep P & H shovels going during the rainy season in Cuba

The bull that gets there

Gasoline, because of its portability, is the only fuel that gets thru. Two Waukesha-equipped power shovels running twenty hours a day never quit on account of the daily downpour. Twenty miles of sucking mud knee deep to an overgrown giraffe separated the shovels from the railroad. But 12 head of well-fed bulls got gasoline thru and the rainy season did not hold up bulls, shovels or work.

For the tough job and the one farthest from supplies you will find experienced contractors pick Waukesha-powered machinery. They know Waukesha "Ricardo Head" engines have no equal for economy—here is a case where every gallon counts—or for reliability and power—where a break-down may mean days of expensive idleness. Waukesha Heavy-Duty Industrial Engines are used by those manufacturers most jealous of their reputation. Write for Industrial Bulletin No. 662.

N-832-L

INDUSTRIAL EQUIPMENT DIVISION

WAUKESHA MOTOR COMPANY

Waukesha Wisconsin

New York	Tulsa	Houston	San Francisco
8 W. 40th Street	*C. F. Camp Co.*	*Portable Rig Co.*	*C. A. Watts*

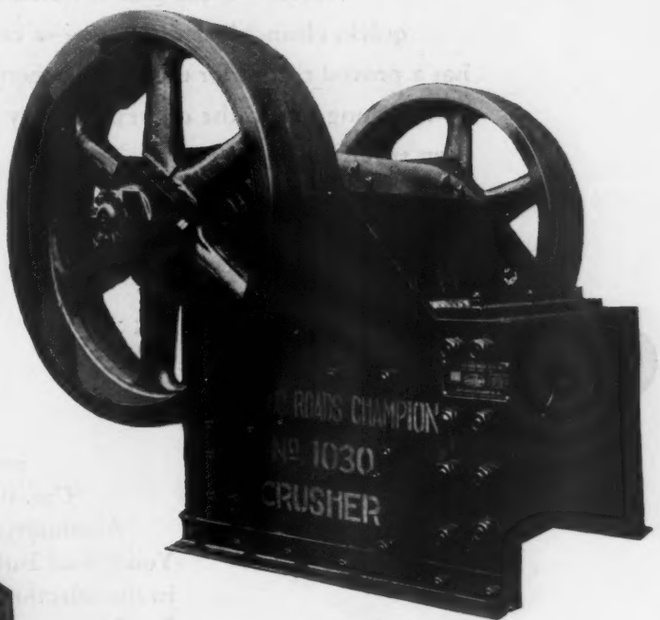
Exclusive Builders of Heavy-Duty Gasoline Engines for Over Twenty Years

When writing advertisers, please mention ROCK PRODUCTS

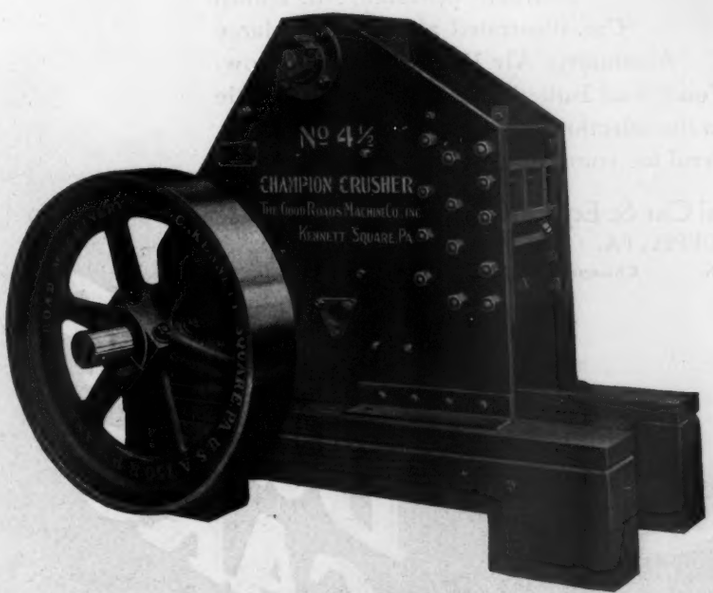
CRUSHERS!

Crushers. One unit only among the many required for quarry operation, yet that one unit can either cause more trouble or bring more satisfaction than any other piece of equipment. With Champion crushers, nothing but satisfaction can result; first, because they are "Good Roads built"; second, because their design has proved more satisfactory through nearly forty years of successful operation; and third, because the crushing principle is the most simple and least injurious to the unit itself.

Whether it is fine reduction or primary crushing, there is a Good Roads Champion Crusher that is adaptable to your operation.



Champion 1030 Crusher



Champion 4½ Crusher

The Good Roads Machinery Co., Inc.

Kennett Square, Pa.

CHICAGO, ILL.
NEW YORK, N. Y.
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Better Write Today and Get on Mailing List for 1928 Quarry Equipment Catalog

If you want a dump car that is built for the hardest service—a car that is noted for its quick, clean, clear discharge—a car that has a proved record for economy, dependability and long-life in the quarry industry then specify—

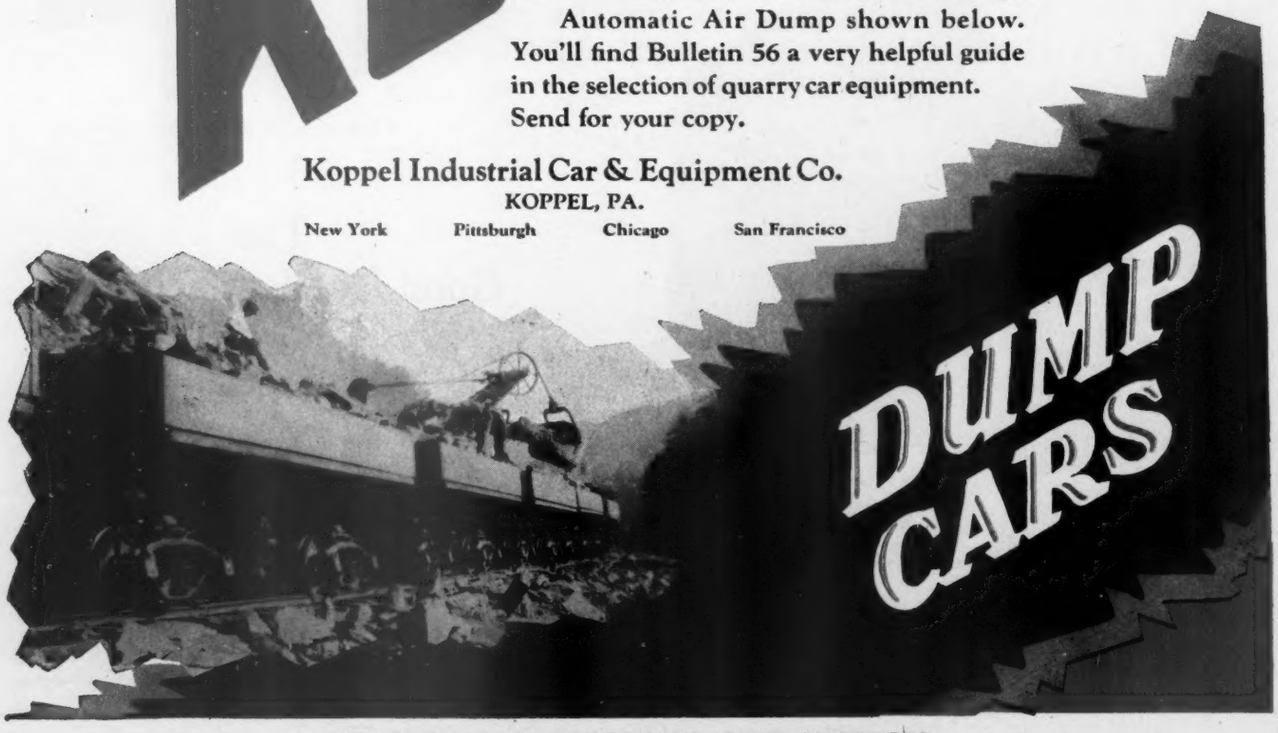
KOPPEL

KOPPEL
TRADE MARK REGISTERED U.S. PATENT OFFICE

KOPPEL
TRADE MARK REGISTERED U.S. PATENT OFFICE

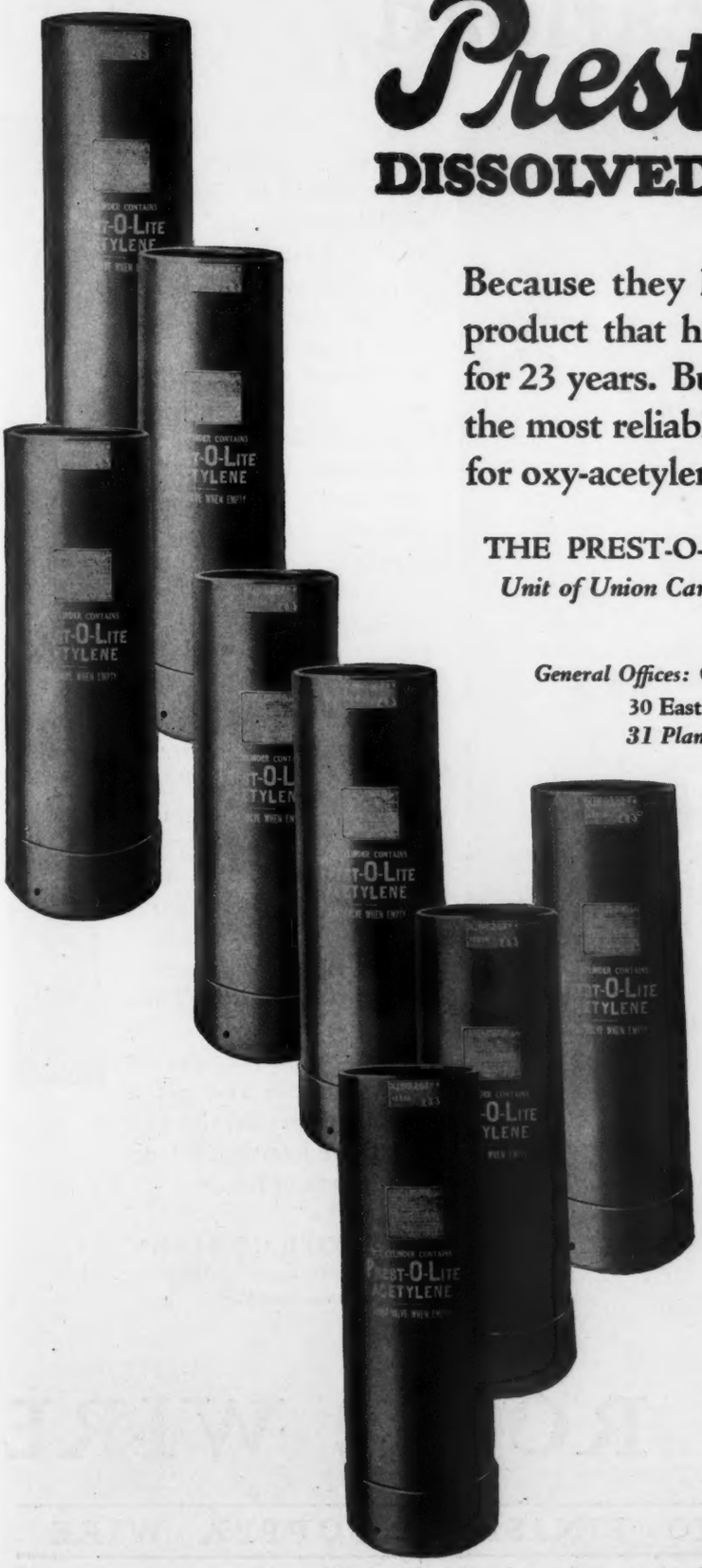
Obtainable in a wide variety of types, sizes and capacities, from the Square Box, manually operated, Side Dump Car, illustrated above, to the large Automatic Air Dump shown below. You'll find Bulletin 56 a very helpful guide in the selection of quarry car equipment. Send for your copy.

Koppel Industrial Car & Equipment Co.
KOPPEL, PA.
New York Pittsburgh Chicago San Francisco



People keep right on buying

Prest-O-Lite
DISSOLVED ACETYLENE



Because they have confidence in a product that has been manufactured for 23 years. But mainly because it is the most reliable and economical fuel for oxy-acetylene welding and cutting.

THE PREST-O-LITE COMPANY, INC.
Unit of Union Carbide and Carbon Corporation

UCC

General Offices: Carbide and Carbon Building
30 East 42d St., New York
31 Plants—102 Warehouses

Not a kink in a carload

If we wished to change the well known slogan a little more, we might say, "Not a kink in a year's production."

Either one is a safe statement because Super Service is different from all other portable cables. Different because it is made differently. Every foot is vulcanized, in steel molds, under tons of pressure. The outer jacket of rubber is condensed until it is too tough and flexible, too supple to kink.

But the vulcanizing process does more than stop kinking. It increases the tensile strength and the resistance to abrasion until you have a cable that will stand the gaff of life in quarry, pit or strip mine month after month. A cable built to carry current to expensive shovels, or mining machines — and keep them running all the time.

If your portable cables are giving out too fast get a length of Super Service and let it prove its worth in long life and lack of trouble.

ROME WIRE COMPANY
DIVISION *of* GENERAL CABLE CORPORATION
Rome, New York

SUPER SERVICE
CORDS and CABLES

Note how the vulcanizing condenses and toughens the rubber jacket.

ROME WIRE

2837

FROM WIRE BAR TO FINISHED COPPER WIRE

AND NOW THE 2300TH P&H IS SERVING ITS OWNER

There are more P & H Gasoline Driven Excavators in Service than any other make

½ - ¾ - ⅞ - 1 and 1¼
YARD CAPACITY

P&H

HARNISCHFEGER CORPORATION
Established in 1884
3865 National Avenue, Milwaukee, Wis.
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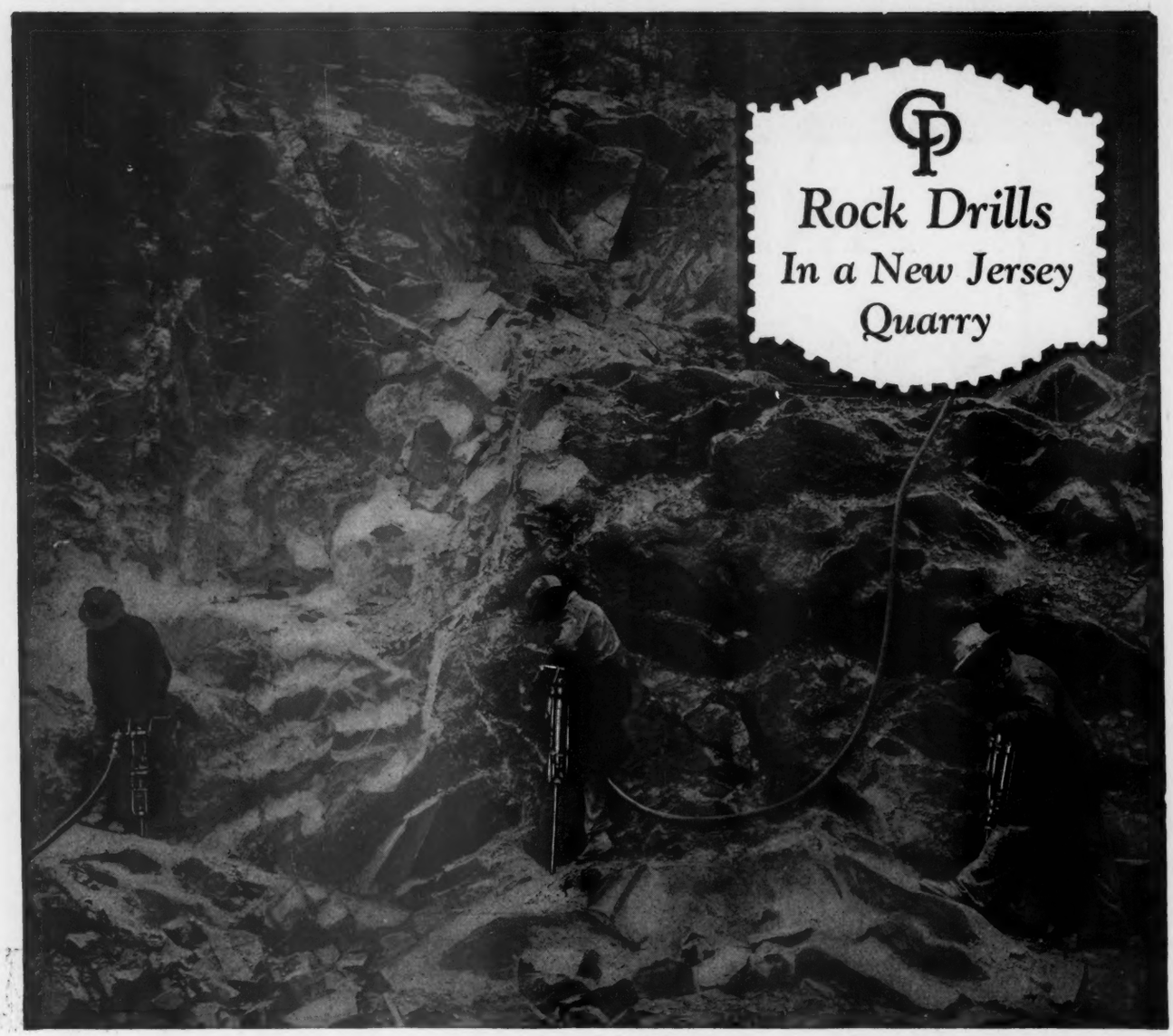


THESE CP-10 Sinkers enable the quarry owners to produce a large volume of rock in a short time at a minimum cost. Three drills, using 12 to 14 ft. steel and air supplied by a CP Portable Air Compressor, keep the crushing plant operating to capacity.

Wherever drilling is to be done, CP drills can show most convincing results. For example, one of the country's largest contracting firms recently conducted severe competitive tests which resulted in discarding other drills in favor of CP's. That firm (name on request) now has over 100 CP Rock Drills in use.

We welcome tests with any drills—may we send you our Rock Drill Bulletin?

CHICAGO PNEUMATIC

Chicago Pneumatic Tool Co.

Sales and Service Branches all over the world

R-128

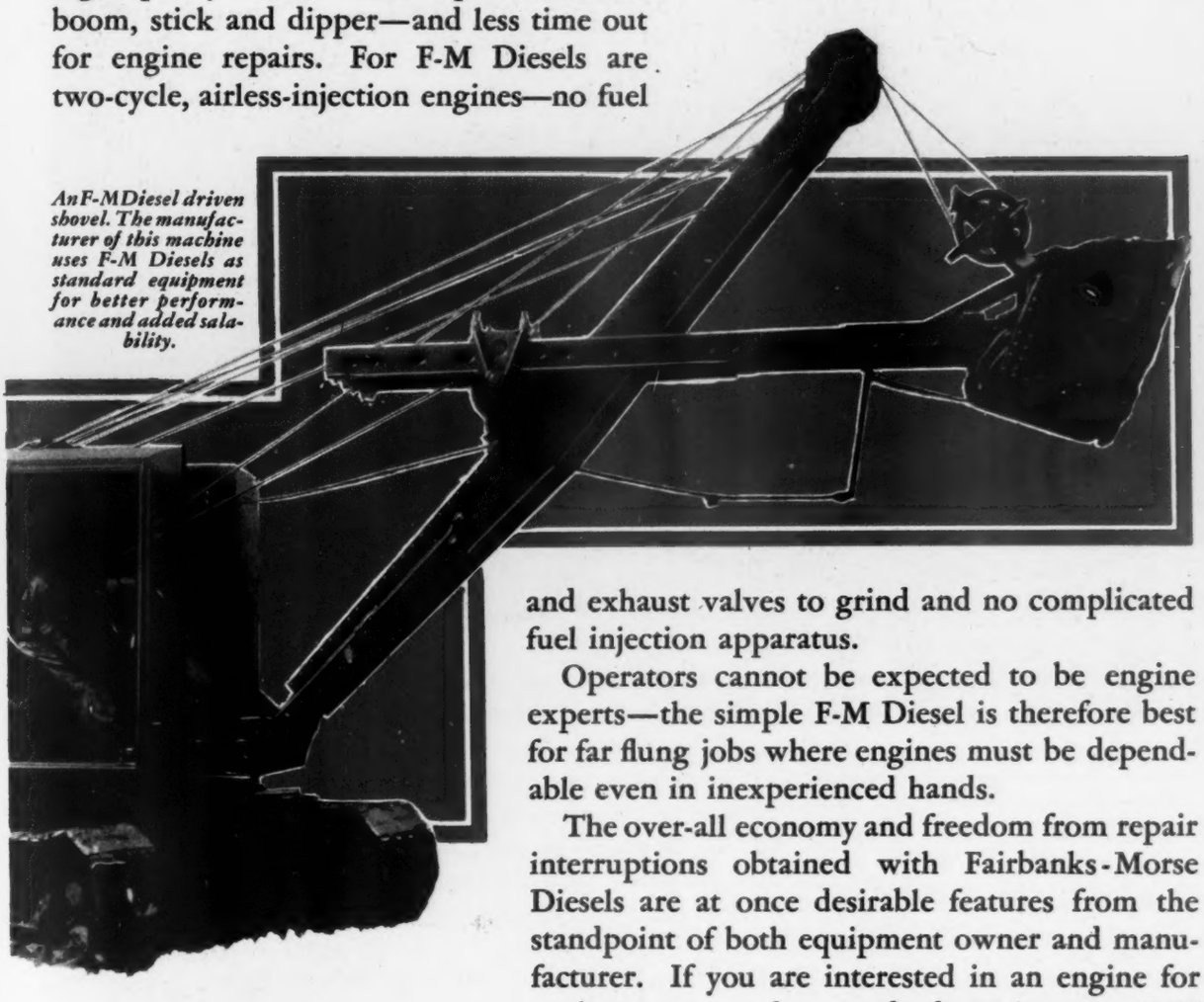
6 East 44th Street New York, N. Y.

CHICAGO PNEUMATIC

When writing advertisers, please mention ROCK PRODUCTS

The ENGINE *that puts more yards in the* DIPPER!

Fairbanks-Morse Diesel Engines for shovels, draglines, clamshells, cranes, etc., increase returns on equipment by increasing working capacity. More reserve power behind boom, stick and dipper—and less time out for engine repairs. For F-M Diesels are two-cycle, airless-injection engines—no fuel and exhaust valves to grind and no complicated fuel injection apparatus.



An F-M Diesel driven shovel. The manufacturer of this machine uses F-M Diesels as standard equipment for better performance and added salability.

Operators cannot be expected to be engine experts—the simple F-M Diesel is therefore best for far flung jobs where engines must be dependable even in inexperienced hands.

The over-all economy and freedom from repair interruptions obtained with Fairbanks-Morse Diesels are at once desirable features from the standpoint of both equipment owner and manufacturer. If you are interested in an engine for replacement or for standard equipment, F-M Engineers are at your service in working out the practical details.

POWER, PUMPING AND WEIGHING EQUIPMENT

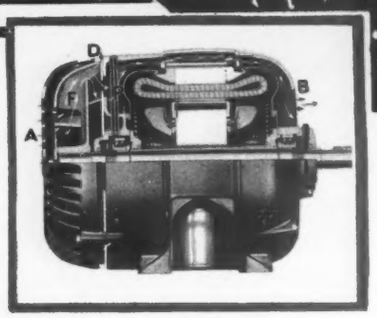
FAIRBANKS-MORSE DIESEL ENGINES

FAIRBANKS-MORSE DIESEL ENGINES

FAIRBANKS-MORSE *Motors*

Self-Ventilating Self-Cleaning

NO PIPING!



A *Air inlet at free end of motor.*
F *Specially designed fan which functions as an air cleaner.*
D *Vent for foreign particles thrown out centrifugally by fan.*
B *Clean air flows around winding shield and exhausts at opposite end of motor.*
P *Plunger device for greasing ball bearing without removing fan guard or bearing arms.*

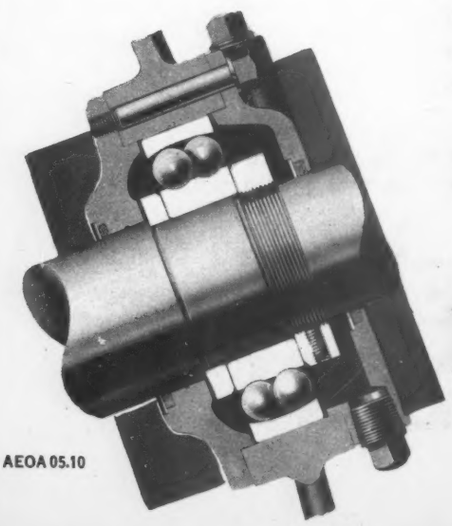
A STANDARD motor with all the features that industry expects from Fairbanks-Morse—but now furnished in an all-enclosed, *self-ventilating type.*

On those jobs that formerly required breather and vent piping to the outside you can now install the F-M Type "HAC" Motor with all the speed, convenience and economy of a standard open type motor application.

A specially designed fan pulls in air through the free end of the motor and expels all foreign particles. Clean air is then passed back through the ventilating spaces. The extra speed and economy are secured without compromise to safety. Operating and maintenance men in every industry are acclaiming this motor as the ideal installation for dirty and dusty drives.

Before you purchase your next enclosed motors be sure and get full information on this important Fairbanks-Morse contribution to the power problems of industry.

FAIRBANKS, MORSE & CO., *Chicago*
Branches and Service Stations Covering Every State in the Union



AEOA 05.10

FAIRBANKS-MORSE MOTORS

Improving brand-new tools

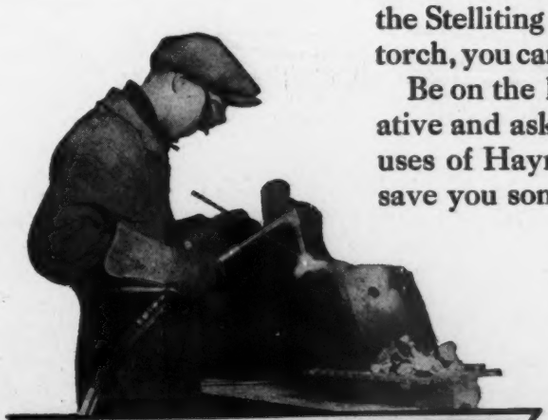
SOUNDS like a queer idea. Yet many a brand-new casting, forging or piece of equipment is coated with Haynes Stellite before it is put to work. Maybe it is only a drop of Stellite on a belt shifter. Maybe it is enough to cover the edge of an oil well tool. Or it may be as much as 150 pounds on the wearing surfaces of a dredging cutter or grinder ring.

Regardless of the amount, Haynes Stellite pays for itself many times over. It increases production, reduces tool costs, saves time and labor.

Here is the reason. Haynes Stellite is an alloy of cobalt, chromium and tungsten. There's a combination that is hard — and hard to beat. It resists abrasion better than any other metal, and outlasts steel three to five times.

Many manufacturers now supply Stellited parts. In the form of welding rod, Haynes Stellite is always available. What's more, by the Stelliting process with the oxy-acetylene torch, you can apply it right in your own shop.

Be on the lookout for our sales representative and ask him some questions about the uses of Haynes Stellite. He may be able to save you some money.



Stelliting with

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

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HAYNES STELLITE

PLYMOUTH LOCOMOTIVES DIESEL

Plymouths

THE OHIO HYDRATE & SUPPLY CO.
MANUFACTURERS OF
LIME - CRUSHED STONE - DOLOMITE
OFFICES AND PLANT
WOODVILLE, OHIO

March 8, 1928

The Fate-Root-Heath Co.,
Plymouth, Ohio.

Gentlemen:

You may be interested to know our experience with your six locomotives used throughout our Finishing Lime plant, at Woodville.

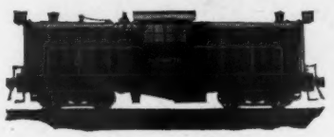
The two three-ton friction type 36-inch gauge, used in handling lime have been in service for five or six years. One, eight-ton and one, five-ton gear driven, 36-inch gauge, have been in use in the quarry for a number of years and the two, eight [illegible] standard gauge, have also been in use in [illegible] several years.

Our [illegible] has been very gratifying. They have been in [illegible] operation. The cost of maintenance has [illegible] low considering the enormous tonnage handled.

We also wish to compliment you and your employees on the prompt and efficient manner in which you have handled our business. We would be pleased to recommend your locomotives to any prospective customers.

Very sincerely yours,
THE OHIO HYDRATE & SUPPLY CO.
By. Fred [illegible]
President

The PLYMOUTH LINE OF GASOLINE AND DIESEL LOCOMOTIVES IS COMPLETE FROM 2 TON TO 50 TON SIZES



50-TON DIESEL

ONE DOMINANT PURPOSE—TO BUILD THE BEST

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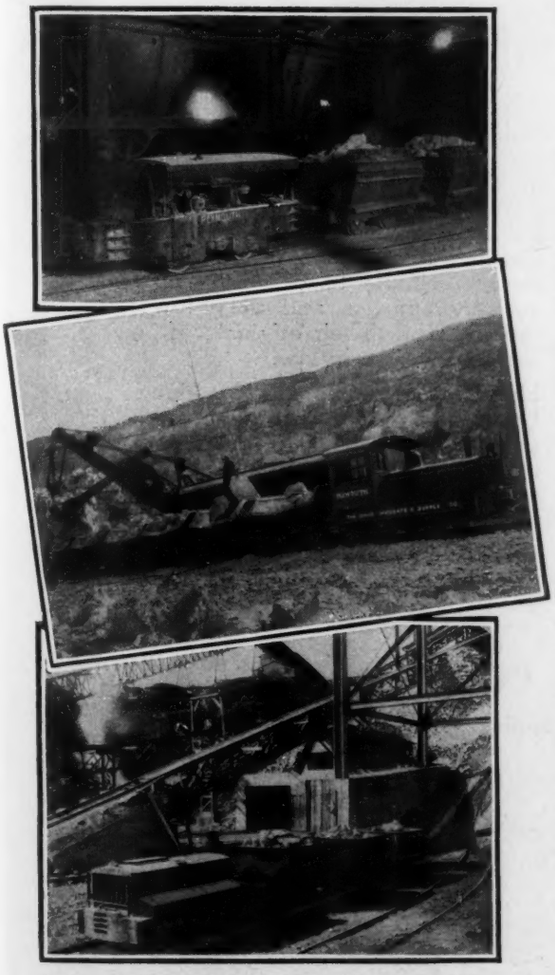
handle enormous tonnage - the Cost of maintenance very low-



TIME IS THE TEST. IT'S THE SAVING IN OPERATION COST THAT COUNTS

From November, 1923 to March, 1927 The Ohio Hydrate and Supply Company have bought and are using two 3-ton, one 4-ton, one 8-ton and two 18-ton Plymouth Gasoline Locomotives.

Their satisfaction in the performance and economy of all of them is plainly expressed in Mr. Fred Witmer's letter.

In the short messages and sales talks we send to you and publish in many trade publications we let you see Plymouths in action and let you hear from their owners just what they do for them.

We know it pays any company to invest in economical haulage and we have built our business by giving hundreds of firms the satisfaction of this economy thru Plymouth Locomotives.

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
210 Riggs Avenue
PLYMOUTH, OHIO

PLYMOUTH

Gasoline and Diesel Locomotives

GASOLINE AND DEISEL LOCOMOTIVES IN THE WORLD

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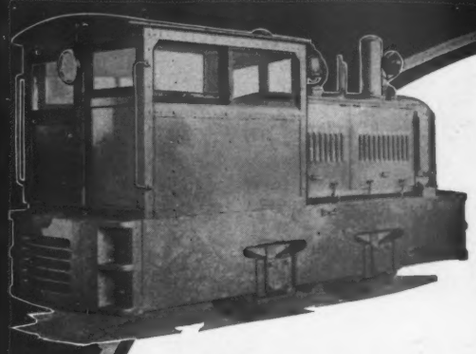
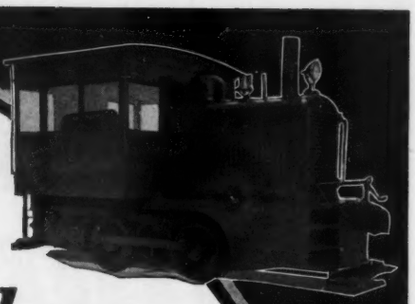




Invariably—
Haulage Costs are Lower

THE experience of Whitcomb users is something not to be overlooked by the industrial plant operator who seeks dependable, low cost haulage. After all, the measure of value is performance—and the manner in which Whitcomb Gasoline Locomotives are performing for others—with haulage problems similar to your own—is a fair indication of the kind of service you can expect.

We have many interesting reports from Whitcomb users telling us about the savings they have accomplished. You, also, can expect similar results.

To the question—"How can we reduce hauling costs?"—there is no better answer than the Whitcomb Locomotive. "Whitcombs" afford better and more economical haulage because they are ever dependable — flexible — always ready — simple to operate — no standby expense and very low upkeep cost. Their original cost, too, is surprisingly low.

Hundreds of Whitcomb Gasoline Locomotives—on every imaginable type of track haulage operation—are bearing out their reputation of **more power per ton of weight.**

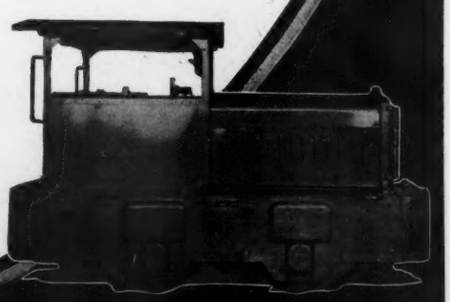
Made in all sizes from 2½ to 50 tons, for all track gauges. Gasoline or electric powered.

Let us show you how Whitcombs will reduce your handling costs.

GEO. D. WHITCOMB COMPANY

Plant at Rochelle, Illinois

OFFICES IN PRINCIPAL CITIES



WHITCOMB LOCOMOTIVES

GASOLINE ELECTRIC

Listed as standard by the Underwriters' Laboratories, Inc.

Perhaps *you* need a Carbic Portable Generator*

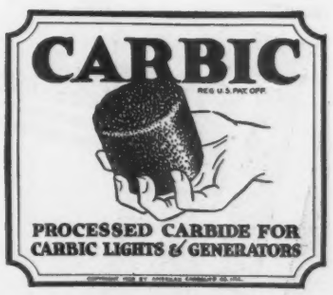
IF you need a truly portable supply of generated acetylene. Or if you do welding only occasionally but must have an acetylene supply ready at all times. Then the Carbic Portable Generator is just what you need.

With only a small initial investment you are assured a supply of low pressure acetylene always ready for any ordinary welding or cutting work.

Thousands of Carbic Generators have been in use for years in all branches of industry. Perhaps *you* need one.

Send for our new catalogue.

OXWELD ACETYLENE COMPANY
Unit of Union Carbide and Carbon Corporation
New York City, 30 East 42d St. UCC Chicago, Peoples Gas Bldg.
San Francisco, Adam Grant Building



A standard drum of Carbic contains forty cakes, size No. 20. Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses.

CARBIC GENERATOR

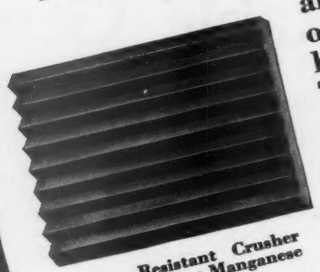
For Oxy-Acetylene Welding and Cutting

**Anyone having a Carbic Generator is entitled to Oxweld Generator Service. Phone or write to the nearest district office.*

CRUSHER, PULVERIZER *and* HAMMER MILL PARTS

Roll Crusher Segments of Amsco Manganese Steel withstand more punishment and last longer

An Amsco Corrugated Pulverizer Roll Shell



Wear Resistant Crusher Jaws of Amsco Manganese Steel

Hammers and Hammer Clips made of Amsco Manganese Steel have an assured longer life

Be sure to order the new formula Amsco Manganese Steel—the controlled mix Manganese Steel that gives longer life and trouble-free operation under the most severe service conditions.

This new-day Manganese Steel, available only from the foundries of the American Manganese Steel Company, is truly the "Toughest Steel Known," and is ideally suited for use in Crusher, Grinder, Pulverizer and Hammer Mill Parts, because it actually becomes harder and more resistant to wear under the incessant pounding, squeezing action of stone or rock crushing.

This improved shock, wear and abrasion resistant metal is not only available in Crusher Parts, but also in Crane, Shovel and Tractor Crawlers and Parts, Dippers and Dipper Teeth, Chains, Sprocket Wheels, Elevator Buckets, Mill Liners, Grinding Balls, Grab Buckets, Screw Conveyors and Box Liners, Apron Conveyors. Cement, stone, lime, gypsum and sand and gravel plants everywhere are using it on every machine and equipment part that is subjected to shock, wear and abrasion. Let us tell you more about Amsco Manganese Steel.

For the parts that require heat and corrosion resistance, FAHRALLOY, the most modern heat and corrosion resistant series of alloys, combines the correct physical and chemical properties to insure unusually long life.

CHICAGO HEIGHTS, ILLINOIS
NEW CASTLE, DEL.
OAKLAND AND LOS ANGELES, CALIFORNIA

AMSCO

AMERICAN MANGANESE STEEL COMPANY
GENERAL OFFICES
333 NORTH MICHIGAN AVE. CHICAGO, ILLINOIS

BURNSIDE, CHICAGO
DENVER, COLO
SOUTHERN MANGANESE STEEL CO.
ST. LOUIS, MO.

TELSMITH-AJAX

built on the ball mill principle

tandem jacket-all metal

A new way washer that does the job right!

The ordinary gravel washer works pretty well ***until it strikes clay.*** That's where the new ***all-metal*** Ajax—the washer with the ***tandem sand and pea gravel jacket***—is most efficient. It is designed to wash out the clay balls; and does it well.

The Ajax embodies a practical and remarkably successful application of the ball mill principle to the gravel washer. The full grinding action of the larger pebbles is completely utilized to pound the pestiferous clay balls to a paste that is easily washed out.

The large pebbles pass through slowly, their passage being retarded by a series of retainer rings in the scrubber. To prevent interference with the grinding process, the sand is rapidly flushed out through the scrubber's perforations. The big pebbles are given every opportunity to "knock the tar" out of Mr. Clay Ball—and they do it.

The first section of the tandem jacket surrounds the scrubber, and the sand passes through its 3/16 to 1/4 in. punchings. The jacket's second section encloses the first stone screen and its 1/2, 3/8 and 3/4 inch holes pass the small rock. The tandem jacket prevents small rock from carrying over—insures more accurate classification. Bulletin A. W. 11 tells the story in detail. ***Write for it.***

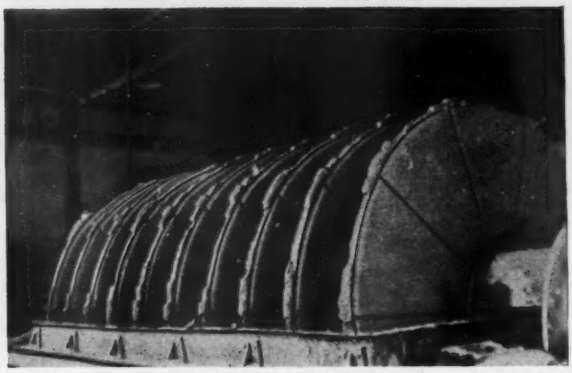
SMITH ENGINEERING WORKS
86 Capitol Drive Milwaukee, Wis.

Canadian Representative: Canadian Ingersoll-Rand Co., Montreal, P. Q.

11 West 42nd St., New York City | Old Colony Bldg., Chicago, Ill. | Harrison Bldg., Philadelphia, Pa. | Beckwith Mchy. Co., Pittsburgh, Pa. | Maryland Eq. & S. Co., Baltimore, Md. | Tower Mchy. Co., Cleveland, O.
Milburn Mchy. Co., Columbus, Ohio | Knox Eng. & Eq. Co., Indianapolis, Ind. | Brandeis M. & S. Co., Louisville, Ky. | Borchert-Ingersoll, Inc. St. Paul, Minn. | Bunting H. & M. Co., Kansas City, Mo. | General E. & M. Co., Miami, Fla.

To Wet Process Plant Officials

Besides the large savings in fuel, consider these other advantages to be gained by—



Filtering Slurry On American Filters

Leaving aside for the moment the coal American Filters are saving wet process plants by cutting in half the water content of slurry, consider these other advantages provided by filtered slurry:

Increased Production

As kiln capacity is limited by the coal that can be burned, kilns can produce more clinker if the slurry is first filtered. The coal that was used to evaporate the excess water can be used to burn clinker.

Cleaner Kilns

Cleaner kilns, absence of mud rings, mean more uniform production and less maintenance on linings. Filtered slurry acts more like a dry feed. The heat instantly dries the surface, thus preventing sticking.

Better Cement

A few more parts of water in the slurry permits finer grinding. Finer grinding produces better 24 and 48 hour tests. Filtering takes care of the extra water without loss of production, or without increasing fuel consumption.

Better cement, cleaner kilns, increased production, saving in fuel—slurry filtration is unquestionably a most advantageous step for any wet process plant to adopt.

United Filters' engineers will be glad to outline the specific savings to be obtained in your plant by installing the American Continuous Filter.

UNITED FILTERS CORPORATION

Main Office and Laboratory—Hazleton, Pa.

New York Chicago Salt Lake City Los Angeles

Export Office—25 Broadway, New York Code Address—Unifilter, New York

Fraser & Chalmers (S. A.), Ltd., Johannesburg

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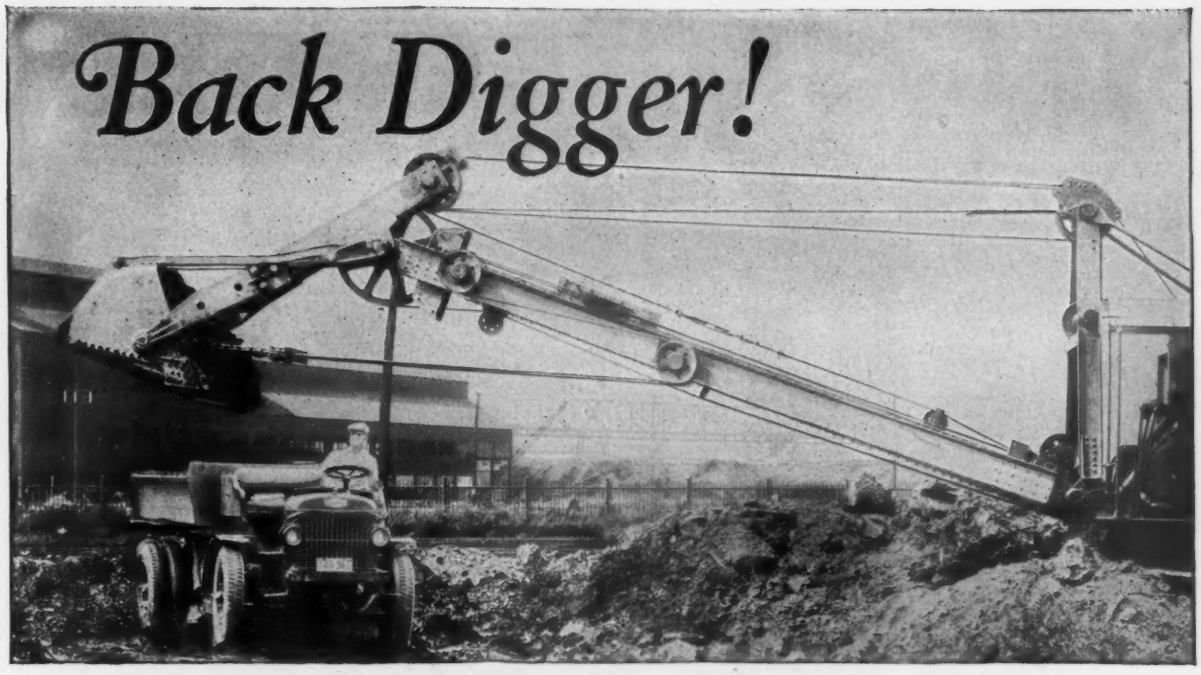

The TIP-AND-TILT Dipper Gives Five NEW Back-Digger Advantages!

IN removing *one* limitation of the ordinary Back-Digger, Thew gained no less than *five* new and distinct operating advantages over any existing type of Back-Digger equipment. Not only is it now possible to undertake trench and certain classes of ditch and cellar excavation with the assurance of better work at a very low cost, but there are new operations which take the Back-Digger out of its former restricted field and make it a many-job, all-the-year-'round machine.

The outstanding difference of the New Thew Back-Digger is the operator-controlled Tip-and-Tilt Dipper. Now the load can be held until the dipper is spotted at any point—close in or far out—over truck, wagon, bin or spoil pile—then instantly dumped. This one feature opens up new jobs and new profits.

In all the world there is no other machine that can successfully undertake these five operations—

1. Hold material in the bucket until it has been brought to *any* desired dumping position.
2. Completely empty the dipper into trucks, wagons or bins without spilling or dump exactly where the operator wants it on a spoil pile.
3. Cut a *vertical* wall downwardly opposite the machine.
4. Control the cutting angle of the dipper for greatest efficiency in various materials or shapes of cut.
5. Back-fill without disturbing ground on which spoil bank has been dumped; overturning and completely emptying the dipper into the trench.

Thew has *again* proved Engineering Leadership in the New Thew Back-Digger with the operator controlled Tip-and-Tilt Dipper. This Back-Digger equipment can be quickly and easily attached to any Lorain 60 or 75 machine in the field.

Full details of this New Thew Back-Digger are contained in Bulletin 409. New excavating methods may affect your business—write today for your copy.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

LORAIN 60 AND 75

SHOVELS—DRAGLINES CRANES—BACK-DIGGERS

Gasoline Steam Electric Powered

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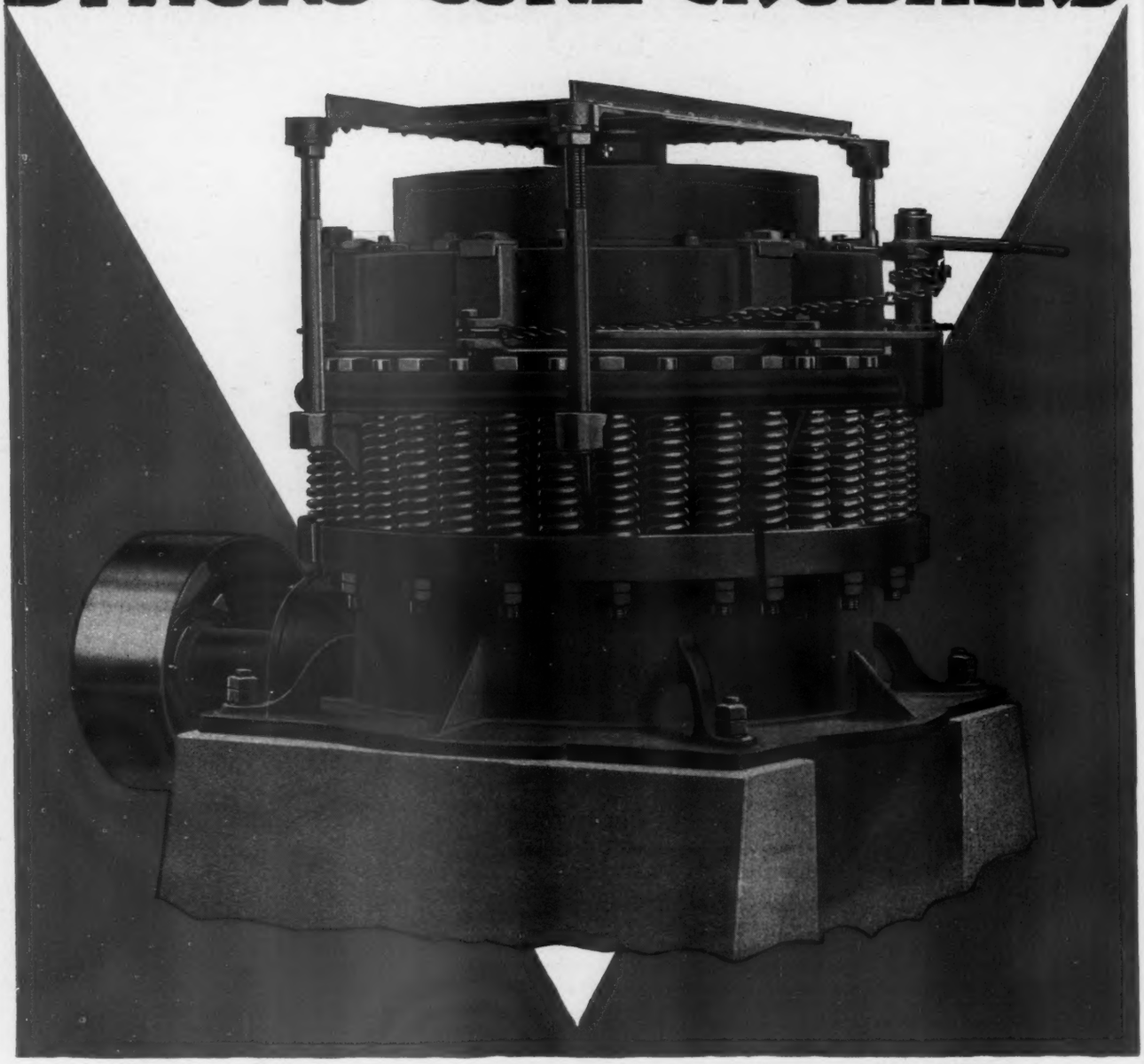

If you want a uniform product—any size from 2 inches to sand —you should know the reasons for the CONE and

—why the CONE has the greatest capacity!
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—why the CONE is proof against tramp iron!
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CASE-HARDENED WEARING BLOCKS
guide the cable and keep it from cutting the top of bucket; blocks can be replaced when they are worn.

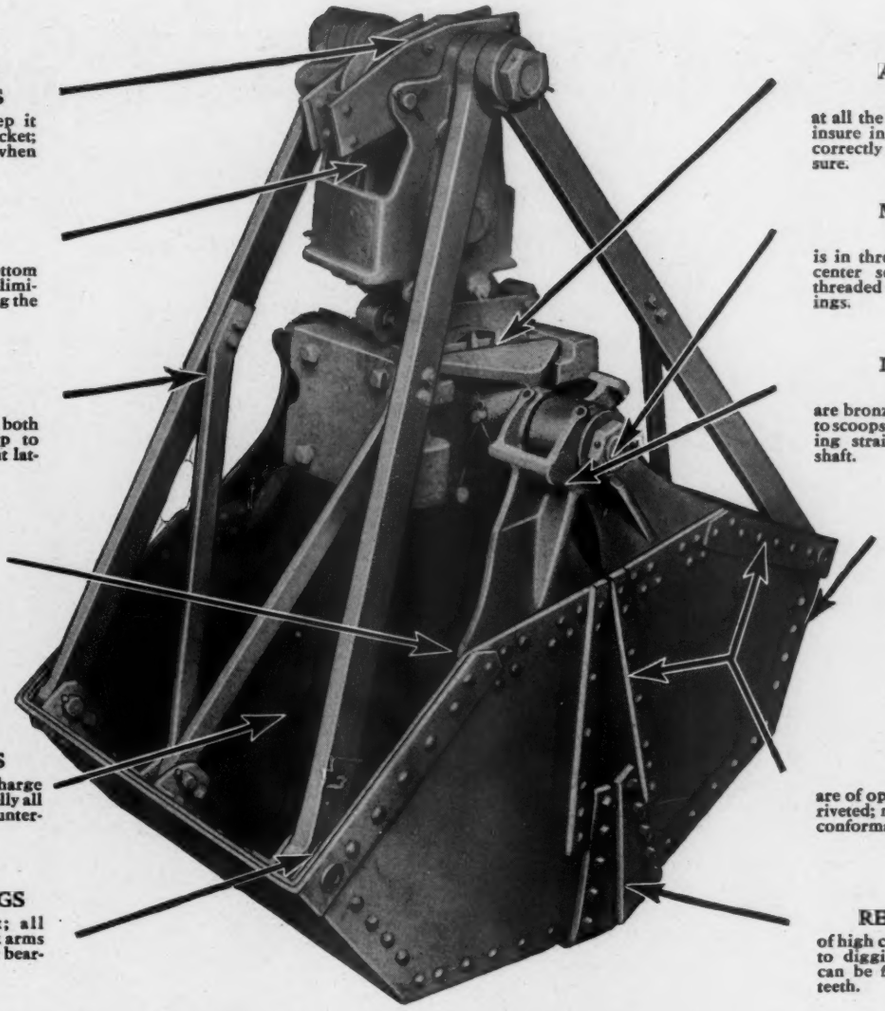
STRAIGHT LEAD SHEAVES
keep the cable in the bottom of the score; they also eliminate side wear and prolong the life of cable.

FLAT BRACED BACK ARMS
are of extra heavy section; both sides pinned at the top to equalize wear and prevent lateral distortion.

OVERSIZE CAPACITY
is a feature; each size of bucket holds rated capacity at struck level.

SMOOTH INSIDE SURFACES
allow the bucket to discharge material quickly; practically all rivets on inside are countersunk.

REMOVABLE BRONZE BUSHINGS
are used throughout; all sheaves, hinges and back arms are bushed with the best bearing material.



ALEMITE-ZERK FITTINGS
at all the vital wearing points insure injection of lubricants correctly and under high pressure.

MAIN CLOSING SHAFT
is in three sections; only the center section needs to be threaded when replacing bushings.

INTERLOCKING HINGES
are bronze bushed and riveted to scoops, eliminating all bending strains in main closing shaft.

STRAIGHT SIDES
are of great advantage in cleaning up a car and getting into corners.

REINFORCED SCOOPS
are of open-hearth steel amply riveted; metal is distributed in conformance with stresses.

REMOVABLE LIPS
of high carbon steel are bolted to digging edge, which also can be fitted with removable teeth.

Every Clamshell Bucket Should Have These Mechanical Advantages

And that's only part of the story. The weight of the Orton bucket is great enough so that it buries itself in the material. The wide spread of the scoops insures a full bucket load every time. Closing action is powerful and speedy, and the smooth inside surfaces affords a lightning-quick discharge. Three trips a minute can be made easily. The straight cable leads reduces the wear on the cable to a minimum.

It's the combination of all these features that makes this bucket so speedy and efficient for digging and handling all kinds of loose materials. Orton owners everywhere are getting added production from their cranes and derricks. Write for names of users in your vicinity, and let them tell you of their success with Orton buckets with these improvements. Built in sizes from ½ to 5 cubic yards. Bulletin on request.

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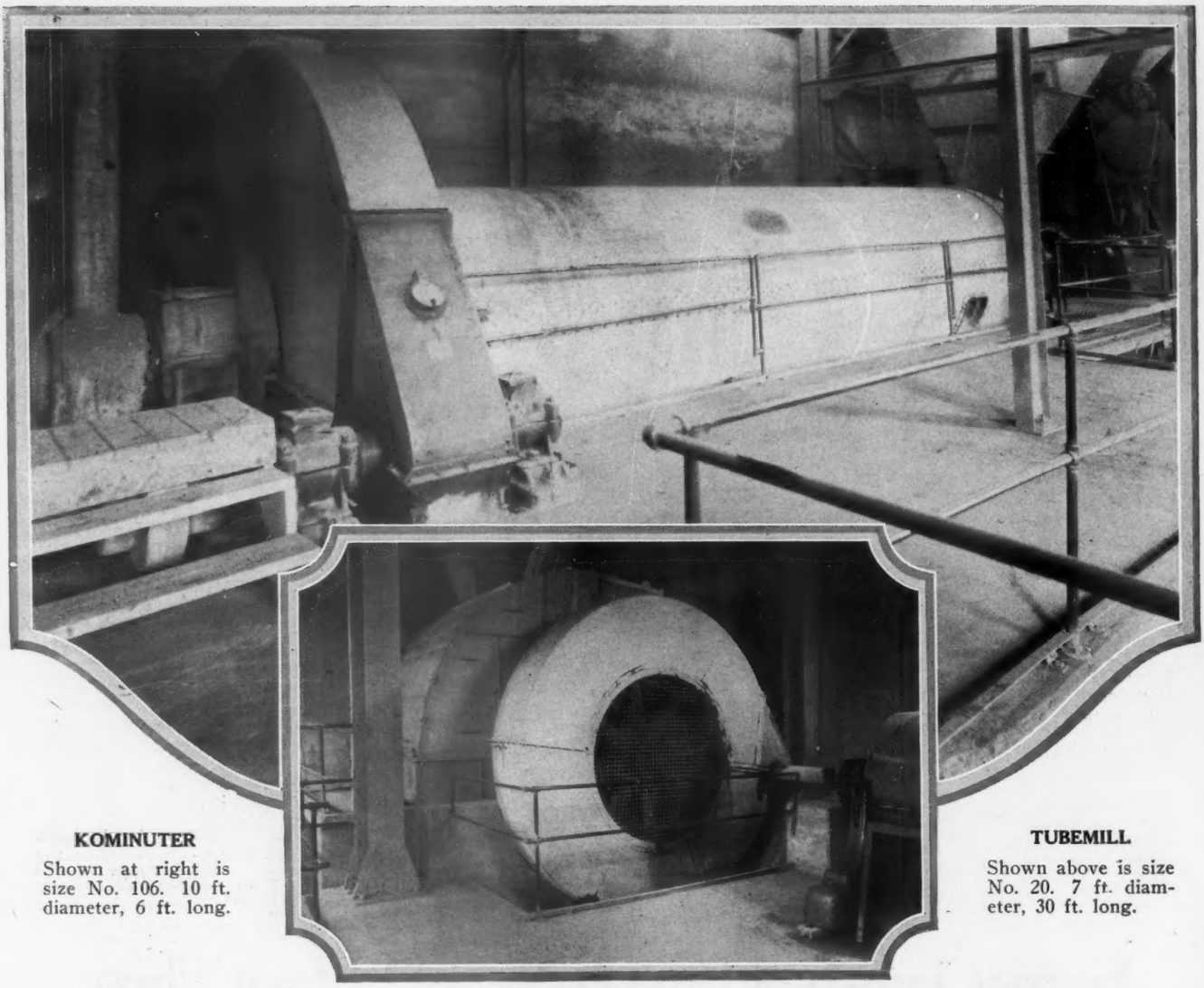

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Shown at right is size No. 106. 10 ft. diameter, 6 ft. long.

TUBEMILL
Shown above is size No. 20. 7 ft. diameter, 30 ft. long.

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DRY KOMINUTER AND TUBEMILL BATTERIES combine flexibility of operation, uniform fineness of product, large capacity per horsepower, and low operating costs.

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The APCODYNS of varying strengths and velocities will run 40 to 50 per cent *more* cartridges per cwt. than the gelatins. Where their use has been found adaptable, the APCODYNS have shot on approximately a cartridge-for-cartridge basis with the gelatins.

If you feel conditions will permit their use, we suggest you give the APCODYNS a trial. Our experts, who have had extensive experience in their application, are available always for any help you may need in determining the adaptability of the APCODYNS to the job you have in mind.

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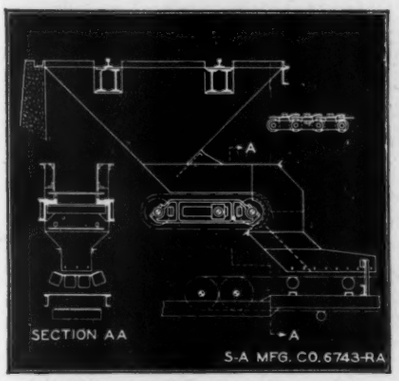
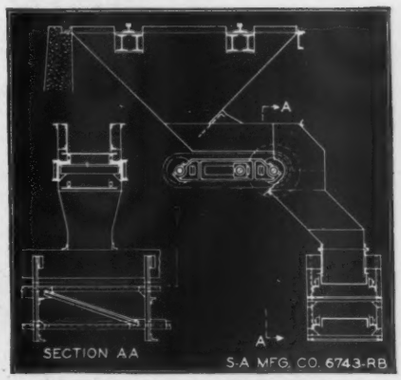
Automatic Feed



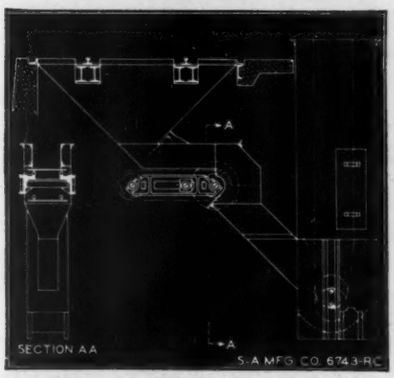
S-A Self-Contained Apron Feeder automatically loading a belt conveyor to full capacity

S-A Pan Feeders automatically withdraw the aggregate from bins and hoppers, delivering to conveyors, screens, etc., in steady volumes which can be regulated to keep units operating at full capacity without danger of overloading.

Automatic feeders are built with overlapping steel pans of various pitches and widths mounted upon strands of roller chain. They range in size from the self-contained apron feeders shown to gigantic units capable of handling entire carloads of lump ore.

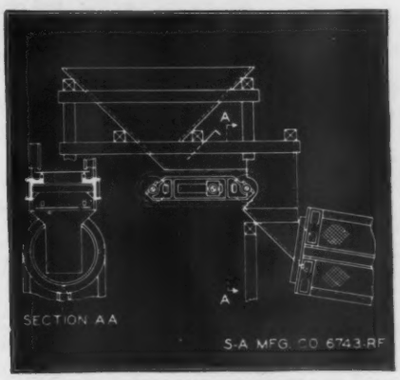


Steel Apron Feeder regulating the flow of material to a pan conveyor



Automatic Feeder withdrawing material from a track hopper to feed a bucket elevator

Write S-A regarding your conditions, the material and capacity to be handled. S-A Engineers will gladly make suggestions.



In this case the feeder automatically controls the flow of aggregate to the screen. No operator is required to prevent over or under-loading

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